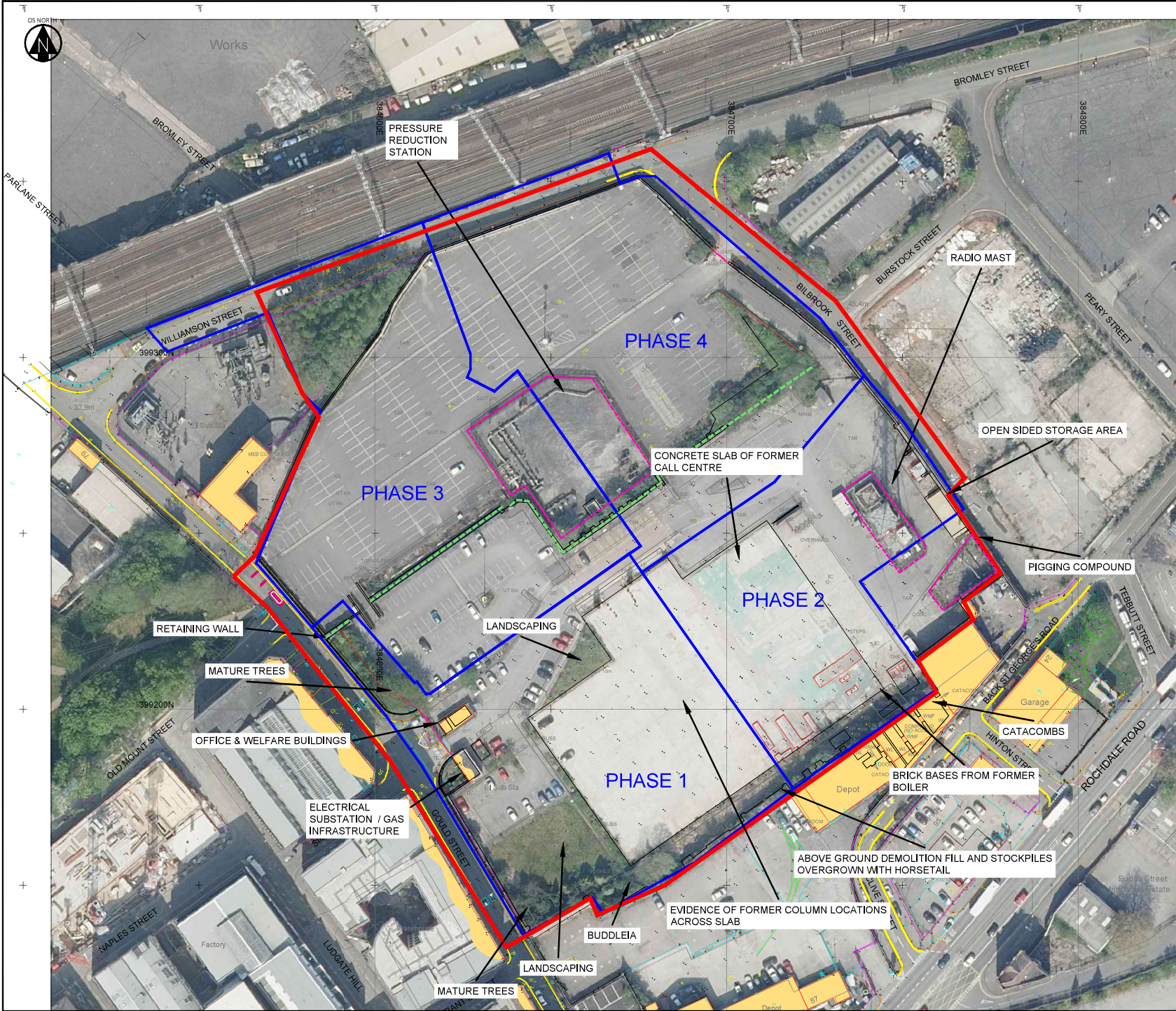


- NOTES
1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figure dimensions only are to be taken from this drawing.
 2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.
 3. This drawing has been based on the following drawings and information:
200414 Merged Topography

- Key:
- Retaining Wall
 - Development Phases
 - Retaining Wall
 - Retained Gas Infrastructure Land

REV	DATE	CHECKED BY	DATE	APPROVED BY	DATE
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					
61					
62					
63					
64					
65					
66					
67					
68					
69					
70					
71					
72					
73					
74					
75					
76					
77					
78					
79					
80					
81					
82					
83					
84					
85					
86					
87					
88					
89					
90					
91					
92					
93					
94					
95					
96					
97					
98					
99					
100					



0 10 20 30 40 50m
SCALE 1:1000

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

KEY

-  SITE BOUNDARY
-  EXISTING STRUCTURES
-  TARMAC
-  TREES / VEGETATION
-  BARE GROUND / GRAVEL?
-  CONCRETE

REV	DESCRIPTION	BY	CHK	APP	DATE
Client:					

NATIONAL GRID PROPERTY HOLDINGS LTD

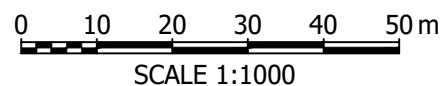
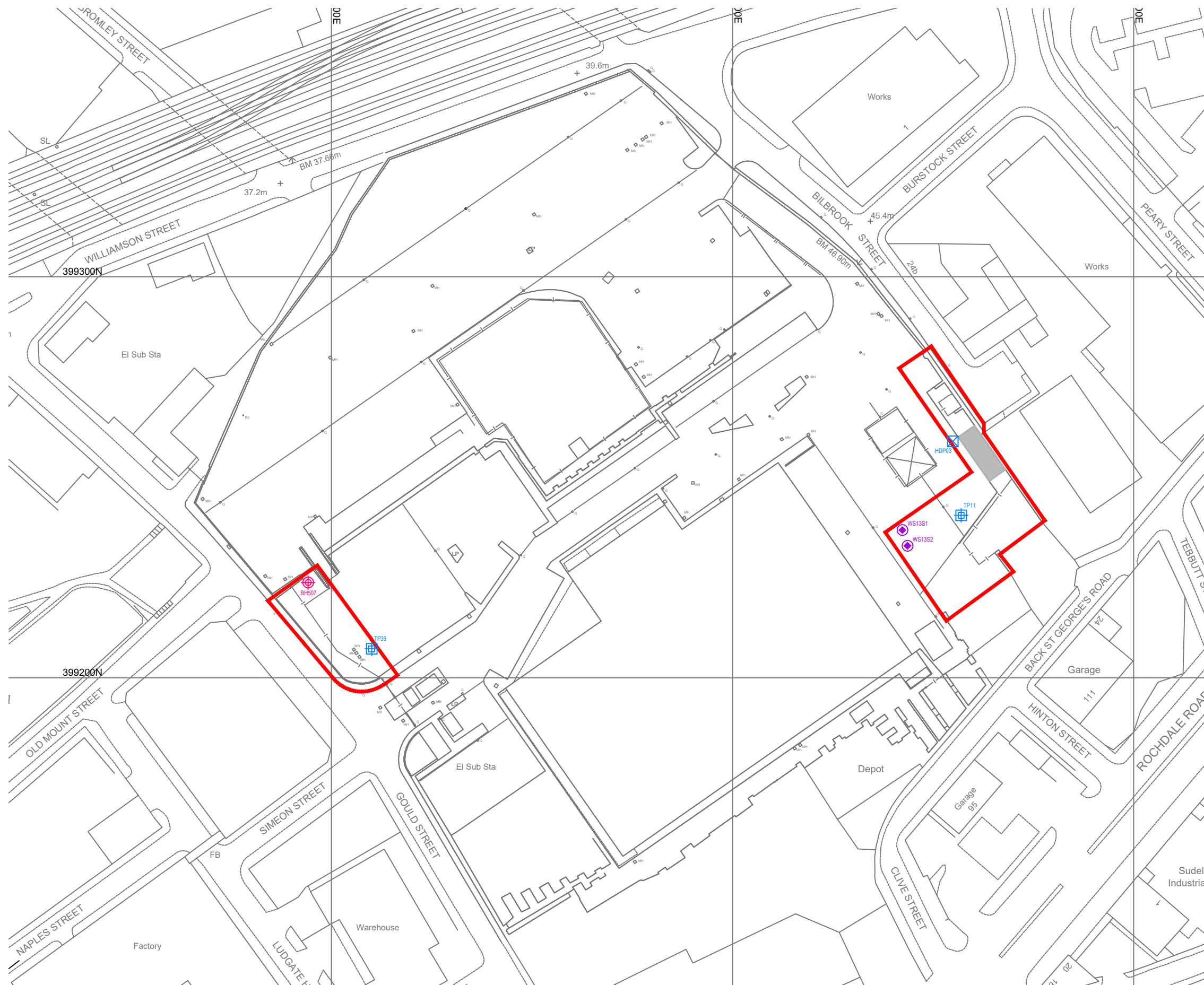
3 SOVEREIGN SQUARE
SOVEREIGN STREET
LEEDS
WEST YORKSHIRE
LS1 4ER
TEL: +44 (0)113 278 7111
e-mail: leeds@wyg.com



Project: B024707
GOULD STREET
MANCHESTER

Drawing Title:
SITE LAYOUT PLAN

Scale @	A3	Drawn	Date	Checked	Date	Approved	Date
1:1,000	CM	23.11.20					
Project No.	B024707	Office	LDS	Type	N	Drawing No.	02
						Revision	



DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

KEY



SITE BOUNDARY



EXISTING STRUCTURES

SITE INVESTIGATION DECEMBER 2011



VALIDATION SAMPLE

SITE INVESTIGATION DECEMBER 2010



BOREHOLE

SITE INVESTIGATION DECEMBER 2003



TRIAL PIT



HAND DUG PIT

REV	DESCRIPTION	BY	CHK	APP	DATE
-----	-------------	----	-----	-----	------

Client:

NATIONAL GRID PROPERTY HOLDINGS LTD

3 SOVEREIGN SQUARE
SOVEREIGN STREET
LEEDS
WEST YORKSHIRE
LS1 4ER

TEL: +44 (0)113 278 7111
e-mail: leeds@wyg.com



Project: B024707

GOULD STREET
MANCHESTER
LOCATION CODE: 0011

Drawing Title:

PREVIOUS EXPLORATORY HOLE LOCATIONS

Scale @ A3 1:1,000	Drawn CM	Date 23.11.20	Checked	Date	Approved	Date
Project No. B024707	Office LDS	Type N	Drawing No. 04		Revision	

APPENDIX A

Chemical Specification for Soils

Quality Control Methodology for Imported and Re-used Soils

Prior to Importation and Re-use

Reliable testing results should be provided, or samples should be obtained at the source and tested prior to either importation to the subject site or re-use on site of origin as early as possible.

The frequency and scope of testing will vary depending on the source, the required testing for possible sources is provided below. These rates are based on professional judgement and acceptance of similar criteria used on similar sites to the satisfaction of the local regulatory authority. Results should be compared to the acceptance criteria also with this appendix.

Material Use	Testing Frequency*	Suite of Analysis					
		1	2	3	4	5	6
Topsoil							
Greenfield Source including Site Won (Top 600mm)	*1 per 50m³						
Brownfield/Recycled Source including Site Won (Top 600mm)	**1 per 50m³						
Subsoil							
Greenfield Source (Top 600mm)	*1 per 150m³						
Brownfield/Recycled Source (Top 600mm)	**1 per 150m³						
Site Won (Top 600mm)	*1 per 150m³						
First Generation (i.e. quarried sand)	No testing required. Certificate of material provenance is required.						
Physical Stone Break Layer							
First Generation (i.e. quarried stone)	No testing required. Certificate of material provenance is required.						
Site Generated / Imported 6F2	*1 per 500m³						
General Fill***							
Site Generated / Imported 6F2	*1 per 1000m³						
Site Won Made Ground	*1 per 250m³						
	*1 per 1000m³						
Site Won Natural Arisings on Brownfield Site	*1 per 1500m³						
Other							
Made Ground Removal Validation	1 sample per 10m of linear excavation						

	to sidewall and 50m ² base.						
--	--	--	--	--	--	--	--

Notes

1 – BSL Default Suite - *Arsenic, Cadmium, Chromium (total and hex), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), water soluble sulphate (2:1 Extract), soil organic matter, and pH.*

2 – Asbestos ID (and Quantification if detected).

3 – TPH Analysis - *Speciated Total Petroleum Hydrocarbons (TPH CWG) including BTEX and MTBE.*

4 – VOC Analysis - *Volatile Organic compounds (VOCs) by GC-MS (ex TIC).*

5 – SVOC Analysis - *Semi-Volatile Organic compounds (SVOCs) by GC-MS (ex TIC).*

6 – Visual Inspection & on-site screening for VOC using calibrated PID.

* - Minimum of 3 samples per source.

** Minimum of 6 samples per source.

***To be used at depths >600mm bgl or below building/hardstanding.

The testing should be undertaken at a UKAS accredited laboratory and be MCERTS accredited and all results should be below existing residential guideline values which are presented in Appendix A.

Topsoil/Subsoil

The above specification is to determine if material is chemically clean, for suitability as a growing medium reference should be made to BS3882:2015 Specification for Topsoil and BS 8601:2013 Specification for Subsoil and Requirements for Use.

In addition to the above sampling frequencies and testing, all imported topsoil/subsoil should also confirm to the following criteria:

-
- Have a maximum stone size of 75mm.
 - Be clean and free of foreign debris including building waste materials or contaminants e.g. brick, glass, asbestos and plasterboard, etc.
-

For imported soils, approval should be obtained from the Local Authority prior to importing to site.

Site Won Crushed Hardcore/Concrete (for use below building/hardstanding only)

In addition to the above sampling frequencies and testing; for re-use of hardcore/concrete (Grade 6) on the site of origin, BSL proposes the following inspection criteria:

-
- No visual contamination (oil staining etc).
 - Limited deleterious material (organics, wood, etc).
 - Limited metal.
 - No visible asbestos containing material (ACM).
 - Quantifiable Asbestos at or <0.001 w/w%.
-

Production of Grade 6 materials should be done under WRAP quality protocols or similar. Inspections and sampling would need to be carried out by a qualified geo-environmental engineer. For geotechnical performance, reference should be made to Series 600 Earthworks Guidance.

If the above criteria for asbestos is exceeded, then further consideration and assessment will be required. Works would need to be undertaken in compliance with the Control of Asbestos Regulations (CAR) 2012 and an Asbestos Plan of Works may be required.

Post Importation

The imported soils should be inspected on site to confirm it is the same material inspected at source and it is suitable for use. Once imported to site, tests should also be undertaken to confirm the batch is suitable prior to use and has not been contaminated in transit.

A management plan should be in place on site for storage and transportation. The material should be stockpiled separately and well segregated on site to prevent cross contamination in accordance with good site practice.

Accurate records of movement of soils should be kept in order to be incorporated in the final verification report.

Approval should be obtained from the Local Authority prior to use on site.

Validation and Verification Report

Site

A final verification report should be issued to the Local Authority/Warranty Provider (e.g. NHBC) detailing records of the re-use and importation of soils, alongside their use on the site.

Cover Layer

Once the chemical suitability of soils used for a cover system in soft landscaping and garden areas has been confirmed, the material can be placed in these areas.

The depth of the cover layer should be recorded, and photographs taken as evidence to be issued to the Local Authority/warranty provider in the verification report.

Approval for the placement of the cover layer should be obtained from the Local Authority/Warranty Provider.

Human Health Remediation Targets			Re-use / Imported Soils Chemical Criteria based on Human health -Commercial (1%SOM)
Source	Contaminant	Unit	
LQM S4UL	Arsenic	mg/kg	640
LQM S4UL	Cadmium	mg/kg	190
LQM S4UL	Chromium (III)	mg/kg	8600
LQM S4UL	Chromium (VI)	mg/kg	33
LQM S4UL	Copper	mg/kg	68000
C4SL	Lead	mg/kg	2300
LQM S4UL	Mercury, Elemental	mg/kg	58
LQM S4UL	Nickel	mg/kg	980
LQM S4UL	Selenium	mg/kg	12000
LQM S4UL	Zinc	mg/kg	730000
LQM S4UL	Phenol (total)	mg/kg	760
LQM S4UL	Acenaphthene	mg/kg	84000
LQM S4UL	Acenaphthylene	mg/kg	83000
LQM S4UL	Anthracene	mg/kg	520000
LQM S4UL	Benz(a)anthracene	mg/kg	170
LQM S4UL / DEFRA C4SL	Benzo(a)pyrene	mg/kg	35
LQM S4UL	Benzo(b)fluoranthene	mg/kg	44
LQM S4UL	Benzo(ghi)perylene	mg/kg	3900
LQM S4UL	Benzo(k)fluoranthene	mg/kg	1200
LQM S4UL	Chrysene	mg/kg	350
LQM S4UL	Dibenz(a,h)anthracene	mg/kg	3.5
LQM S4UL	Fluoranthene	mg/kg	23000
LQM S4UL	Fluorene	mg/kg	63000
LQM S4UL	Indeno(1,2,3,cd)pyrene	mg/kg	500
LQM S4UL	Naphthalene	mg/kg	190
LQM S4UL	Phenanthrene	mg/kg	22000
LQM S4UL	Pyrene	mg/kg	54000
LQM S4UL	TPH Aliphatic EC 5 - 6*	mg/kg	3200
LQM S4UL	TPH Aliphatic EC 6 - 8*	mg/kg	7800
LQM S4UL	TPH Aliphatic EC 8 - 10*	mg/kg	2000
LQM S4UL	TPH Aliphatic EC 10 - 12*	mg/kg	9700
LQM S4UL	TPH Aliphatic EC 12 - 16*	mg/kg	59000
LQM S4UL	TPH Aliphatic EC 16 - 35*	mg/kg	1600000
LQM S4UL	TPH Aliphatic EC 35 - 44*	mg/kg	1600000
LQM S4UL	TPH Aromatic EC 5 - 7*	mg/kg	26000
LQM S4UL	TPH Aromatic EC 7 - 8*	mg/kg	56000
LQM S4UL	TPH Aromatic EC 8 - 10*	mg/kg	3500
LQM S4UL	TPH Aromatic EC 10 - 12*	mg/kg	16000
LQM S4UL	TPH Aromatic EC 12 -16*	mg/kg	36000
LQM S4UL	TPH Aromatic EC 16 - 21*	mg/kg	28000
LQM S4UL	TPH Aromatic EC 21 - 35*	mg/kg	28000
LQM S4UL	TPH Aromatic EC 35 - 44*	mg/kg	28200
LQM S4UL	Benzene	mg/kg	27
LQM S4UL	Toluene	mg/kg	56000
LQM S4UL	Ethyl Benzene	mg/kg	5700
LQM S4UL	Xylene - o	mg/kg	6600

LQM S4UL	Xylene - m	mg/kg	6200
LQM S4UL	Xylene - p	mg/kg	5900
CL:AIRE 2010	MTBE (methyl tert-butyl ether)	mg/kg	7900
NA	Asbestos (No visual ACM)	% w/w	None Detected
pH	BS3882	pH Units	5 - 8.2

LQM/CIEH S4ULs copyright Land Quality Managment Limited reproduced with permission; Publication Number S4UL3237. All rights reserved.

See LQM/CIEH S4ULs Human Health Risk Assessment document for notes regarding derivation.

Criteria for PAH and TPH assumes an SOM of 1%.

*Soil matrix should contain no free product.

which is a range.

Test results to be provided to the engineer prior to placing soils, where appropriate.

All tests result to be undertaken by a UKAS Laboratory holding accreditation for the relevant tests.

Also see Section 5.3 of report: Re-use of asbestos impacted soils.

APPENDIX B

BSL Guidance – Re-use and Disposal of Waste

Re-Use Of Waste - Guidance Note

Definition of Waste

The Environment Agency considers waste to be “...any material that is discarded, or intended to be discarded...” This includes any soil from trenches, footing, site strip etc. It is no longer required in its original location, therefore it is considered to be waste.

CL:AIRE: Code of Practice

Where materials are excavated for construction purposes, wherever possible these should be retained on site for engineering purposes if they are suitable for use. This can be implemented under the CL:AIRE “Development Industry Code of Practice for the Definition of Waste” (CL:AIRE DoWCoP), also commonly referred to as a “Materials Management Plan”.

The developer/contractor is advised to complete all works under the DoWCoP.

Potential scenarios where soils may be able to be re-used:

- Material capable of being used in another place on the same site without treatment.
- Material capable of being used in another place on the same site following ex-situ treatment on site.
- Material capable of being used in another development site without treatment (Direct Transfer).
- Material capable of being used in another development site following ex-situ treatment on another site eg Hub site.

The Code of Practice requires 4 No. Factors to be addressed:

1. Protection of human health and protection of the environment.
2. Suitability of use, without further treatment.
3. Certainty of use.
4. Quantity of material.

In order to satisfy these requirements the following are required:

- i) Consultation/approval with Local Authority & Environment Agency to confirm they have no objections to the proposed re-use of waste soils, or the risk assessments for the site.
- ii) Risk Assessments to demonstrate that the site does not present an Environmental Hazard.
- iii) Remediation Strategy for contaminated sites (or Design Statement for non-contaminated sites).
- iv) Materials Management Plan (MMP) which details material generated stockpiles and the end use.
- v) Volume calculations.
- vi) Planning permission for the development.
- vii) Contractual details to be clear, regarding who steps in if a contractor goes into administration/liquidation.

The use of the CoP is effectively industry regulated, there is a requirement to appoint an independent Qualified Person (QP) who checks all the requirements have been met and registers the documentation with the Environment Agency. This person must not have had any involvement with the preparing of the risk assessments or remedial strategy on the site.

Soils which require treatment on site (eg bioremediation, stabilisation) will require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use.

Site management procedures need to be in place to ensure that material is tracked through from excavation stockpiling, treatment and remediation processes. Should the process of material tracking be considered non-robust, or not adhered to, this may fail the test whether excavated materials may be considered non-waste.

Alternatives include the EA U1 exemption (soils and stones <1000 tonnes and aggregates <5000 tonnes) and the Waste Framework Directive, which applies to naturally occurring soils used on site of origin only. Aggregates can also fall under the EA WRAP Quality Protocols.

Waste Classification For Soils

Introduction

Waste producers have a duty of care to classify the waste they are producing:

- before it is collected, disposed of or recovered.
- to identify the controls that apply to the movement of the waste.
- to complete waste documents and records.
- to identify suitably authorised waste management options.
- to prevent harm to people and the environment.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site. Where this is not possible there are three main options for the disposal of soils:

1. Disposal to a permitted waste recycling facility.
2. Re-use on another site (subject to the suitability).
3. Disposal to a landfill site.

The disposal to a permitted facility will be subject to the **specific conditions of the permits for each individual facility** and will vary dependent on location and environmental sensitivity of the receiving site. Re-use on another site will also be subject to the acceptability criteria of that site.

The guidance below relates to disposal to **landfill sites only**.

Background for Landfill Disposal

In July 2005 the United Kingdom implemented the European Directive 1999/31/EC (The Landfill Directive), this introduced the current regime for waste and waste disposal to landfill. The Landfill Directive places controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill **operator** must be satisfied that the waste meets his permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).

If disposal to landfill is the best management option for the waste soils, these procedures **must** be followed or the operator may refuse to accept the waste.

Key Points

- Not all waste can be landfilled
- Landfills are classified according to whether they can accept **hazardous, non-hazardous** or **inert** wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before you can send them to landfill.
- There are formal processes for identifying and checking wastes that must be followed before wastes can be accepted at a landfill site.

Classification

Wastes are listed in the European Waste Catalogue (EWC 2002) and grouped according to generic industry, process or waste types. Wastes within the EWC are either hazardous or non-hazardous. Some of these wastes are hazardous without further assessment (absolute entries) or are 'mirror' entries that require further assessment of their hazardous properties in order to determine whether they are hazardous waste.

Waste soil has mirror entries on the EWC and as such the first phase of the waste classification process is that of determining if the waste is hazardous or not i.e the hazard assessment. The most common EWC waste codes related to soil are:

17 05	soil (including excavated soil from contaminated sites), stones and dredging spoil
17 05 03*	soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03

Soils may contain certain contaminants (eg asbestos, oil,) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on specific "hazardous properties" which include hazards such as carcinogenicity, flammability and toxicity.

In the first instance the concentrations of plausible contaminants within the soil should be identified and wastes should be **classified based on their total concentrations**.

Waste Definitions

Inert	- Will not undergo any significant physical, chemical or biological transformations. - Will not dissolve. - Will not burn. - Will not physically or chemically react. - Will not biodegrade. - Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. - Has insignificant total leachability and pollutant content. - Produces a leachate with an ecotoxicity that is insignificant (if it produces leachate).
Non-Hazardous	Is not inert (see above) Is not hazardous (see below)
Hazardous	Soil has hazardous properties as defined in WM3 (Guidance on the classification and assessment of waste (1st edition 2015)- Technical Guidance)
Stable Non-reactive hazardous waste#	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents either: in the waste alone (for example, by biodegradation), under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints) or by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that is stable and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes.

WAC Testing

The purpose of WAC analysis is to confirm that the waste complies with the relevant WAC for the receiving landfill. If the waste has any disposal route other than a landfill site (e.g. recycling facility, incineration etc) the **WAC is not relevant**. Furthermore the WAC limits **cannot be used to make an assessment of whether a waste is hazardous**. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.

Classification based on Total Concentrations ¹	Non-Hazardous Waste		Hazardous Waste	
	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	Above hazardous WAC limit values
WAC testing				
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill ²	HAZARDOUS landfill	PRE-TREATMENT ³

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).

2 Individual sites may have certain limit values pre-determined in their licence.

3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.

Hydrocarbons in Soils

WM3 uses the term Oil or Waste Oil to cover hydrocarbons products such as fuel oil, petrol or diesel. These are defined by WM3 as hazardous under an absolute entry in the List of Wastes. However hydrocarbons in soils are a mixture rather than a pure product and are therefore not absolute entries.

Known Oils

The simplest scenario is where the identity of the contaminating oil is known or can be identified. If the oil is known the manufacturer's or supplier's REACH compliant safety data sheet for the specific oil can be obtained and the hazard statement codes on that Safety Data Sheet can be used for the hazardous waste assessment.

Where the identity of the oil can only be identified down to a petroleum group level (i.e. the contaminating oil is known to be diesel, but the specific type/brand is unknown), then the classification of that petroleum group should be used in the assessment. The marker compounds associated with that petroleum group may be used to confirm carcinogenicity.

Oils may contain a range of hydrocarbons, so the presence of for instance Diesel Range Organics (DRO) does not enable the assessor to conclude that diesel is present. These hydrocarbons may have arisen from other oils, the laboratory needs to provide an interpretation of the chromatograph to determine if it is consistent with diesel or weathered diesel as a whole.

The concentration of known oils should be determined using a method that as a minimum spans the range in which the carbon numbers for that known oil fall.

Unknown Oils

Where hydrocarbons are contaminating soils it is likely that the oil will be unknown or cannot be determined.

WM3 states that:

For contaminated land specific consideration must be given to the following before proceeding;

- The presence of other organic contaminants, for example solvents or coal tar that could be detected as hydrocarbons. Coal Tar is not an oil and is considered separately in WM3 example 2. Where the site history or investigation indicates the presence of hydrocarbons from oil and other sources (e.g. coal tar), and the origin of the hydrocarbons cannot reliably be assigned to either, then a worst case approach of considering the hydrocarbons both as waste oil (in accordance with this example) and from other sources, for example coal tar should be taken.
- The presence of diesel, or weathered diesel, should be specifically considered by the laboratory and where this is confirmed by the hydrocarbon profile the oil should be assessed as a known or identified oil (diesel).

The use of **marker compounds** is optional; however it is recommended that where possible the marker compounds should be used.

WM3 states:

If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic/mutagenic due to the presence of oil if all three of the following criteria are met:

- The waste contains benzo[a]pyrene (BaP) at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.1 of the CLP for BaP)
- This has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D of WM3, and
- The analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel.

For example:

TPH Concentration (mg/kg)	Petrol or Diesel	BaP (mg/kg)	Classification
10,000	No	0.9	Non- Hazardous
1,000	No	Not available	Hazardous
1,000	Yes	Not relevant	Hazardous

References

1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert Waste on Land" 2009.
3. Environment Agency "Waste acceptance at landfills - Guidance on waste acceptance procedures and criteria" Nov 2010.
4. Environment Agency "Guidance on the classification and assessment of waste (Technical Guidance WM3)".
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).
6. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
7. 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament
8. Environmental Permitting Guidance The Landfill Directive For the Environmental Permitting (England and Wales) Regulations 2010 Updated March 2010 Version 3.1
9. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).

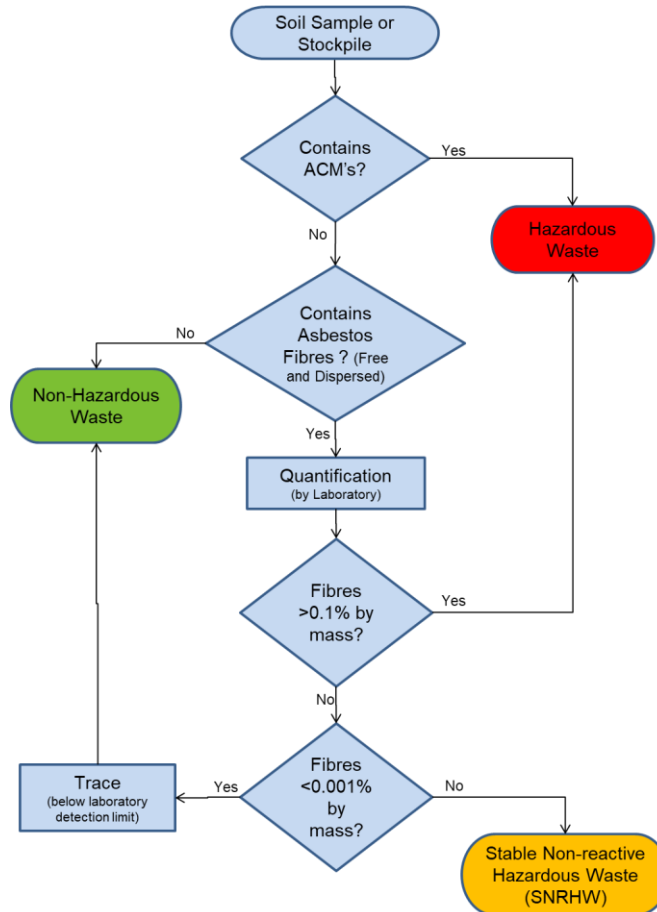
Additional Asbestos Guidance Notes

Disposal

The 1st Edition of WM3 “Guidance on the classification and assessment of waste”, details the way in which Asbestos is assessed within soils.

The assessment of asbestos containing waste is dependent on whether the asbestos is present as:

- Fibres that are free and dispersed, or
- Identifiable pieces of asbestos containing materials (ACM's)



Identifiable pieces of asbestos are any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye. The result is that commonly soils with visible ACM's are sorted and the ACM's removed by hand picking and separate disposal.

Asbestos concentrations below 0.001% by mass are below standard laboratory detection limits and are not currently regarded as containing asbestos for the purposes of disposal and may be disposed of to an inert landfill site¹. These levels are often termed “trace” by laboratories.

Asbestos concentrations between 0.001% and 0.1% are stable non-reactive hazardous waste (SNRHW)¹. Waste transfer stations where soil recycling takes place may be able to take SNRHW, but are unlikely to take soils containing asbestos above trace concentrations.

The following codes should be assigned to the asbestos waste as appropriate:

17 06	Insulation materials and asbestos-containing construction materials
17 06 01	Insulation materials containing asbestos
17 06 03	Other insulation materials consisting of or containing hazardous substances
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05	Construction material containing asbestos

WM3 indicates that 17 06 05 would normally be used in preference to 17 06 01 for the asbestos in asbestos contaminated soil and stones.

Construction materials containing asbestos and “*other suitable materials*” may be landfilled at landfills for non-hazardous waste in accordance with the Landfill Directive without testing.

This means that wastes that are only hazardous because of their asbestos content can be disposed of at landfills for non-hazardous waste in separate landfill cells that only accept asbestos wastes and other suitable materials. The Landfill Directive requires that stable non-reactive hazardous waste shall not be deposited with biodegradable waste (for example organic material, household waste, paper etc..) and must meet the waste acceptance criteria set out in accordance with Annex II.

Construction

Health and Safety Executive (HSE) guidance on asbestos is not directly related to soil and much of the guidance focuses on the removal of asbestos from buildings. The overarching legislation is the Control of Asbestos Regulation (CAR 2012). However where work involves (or is likely to involve) contact with asbestos then CAR 2012 requires a risk assessment including whether or not the work is licensed or notifiable non-licensed work and may require an Asbestos Management Plan. Work becomes notifiable if it is considered that the control limit could be exceeded.

Brownfield sites frequently have soils that contain asbestos and the presence of asbestos needs to be considered within the context of construction, particularly in relation to groundworks. The exposure of soils and the use of excavators and plant to move soil around increases the possibility of fibres becoming airborne. However it is good site practice to not generate dusts and to employ dust suppression on all sites regardless of the presence of asbestos.

The legal control limit for asbestos is 0.1f/ml over a continuous four hour period. The control limit is not a ‘safe’ level and exposure from work activities involving asbestos must be reduced to as far below the control limit as possible.

Clearly the higher the concentrations in the soil the greater potential there is for fibres to be released, however IOM publication TM/88/14 “the release of dispersed asbestos fibres from soil” 1988 concludes that:

- Mixtures of asbestos in dry soils with asbestos content as low as 0.001% can produce airborne respirable asbestos concentrations greater than 0.1f/ml in dust clouds where the respirable dust concentrations are less than 5mg/m³.
- An action limit is recommended of no higher than 0.001% asbestos in soils above which steps should be taken to minimise exposure to airborne fibres (eg by wetting).
- The addition of relatively small quantities (10%) of water can reduce the airborne fibre concentrations by an order of magnitude.

Where asbestos has been identified at concentrations above 0.001% as free and dispersed fibres in the soil precautions need to be adopted. Concentrations below this are considered to be normal background, although good site practice dictates that the generation of dusts should be avoided and therefore any fugitive fibre release from minor concentrations should be kept to a practical minimum.

End Use

The use of materials containing asbestos and material containing asbestos is prohibited under EU legislation. There is currently a Joint Industry Working Group (JIWG) tasked with producing a Code of Practice for Asbestos in Soil, Made Ground and Construction & Demolition Material that will clarify in due course the position of the various government agencies.

Asbestos containing materials can remain in situ under a suitable cover system which may be hardsurfacing or soft landscaping (with or without hard dig layers and markers).

There is a risk that future maintenance may compromise such systems and details of the presence of asbestos should be kept in the Health and Safety File.

Preliminary publications from JIWG (April 2015) provide guides for decision making in relation to construction. These are at a “Beta” test stage and further publications will be provided in due course.

The re-use of waste soils should be undertaken in accordance with the CL:AIRE Code of Practice and is subject to suitable risk assessments demonstrating low risk. There is nothing that specifically excludes the re-use of soils containing asbestos as fill to raise levels. However the movement of materials increases the risk of fibres becoming airborne and suitable precautions will be required. The re-use of soils containing asbestos at concentrations above hazardous waste levels is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be feasible where there is a long program for implementation.

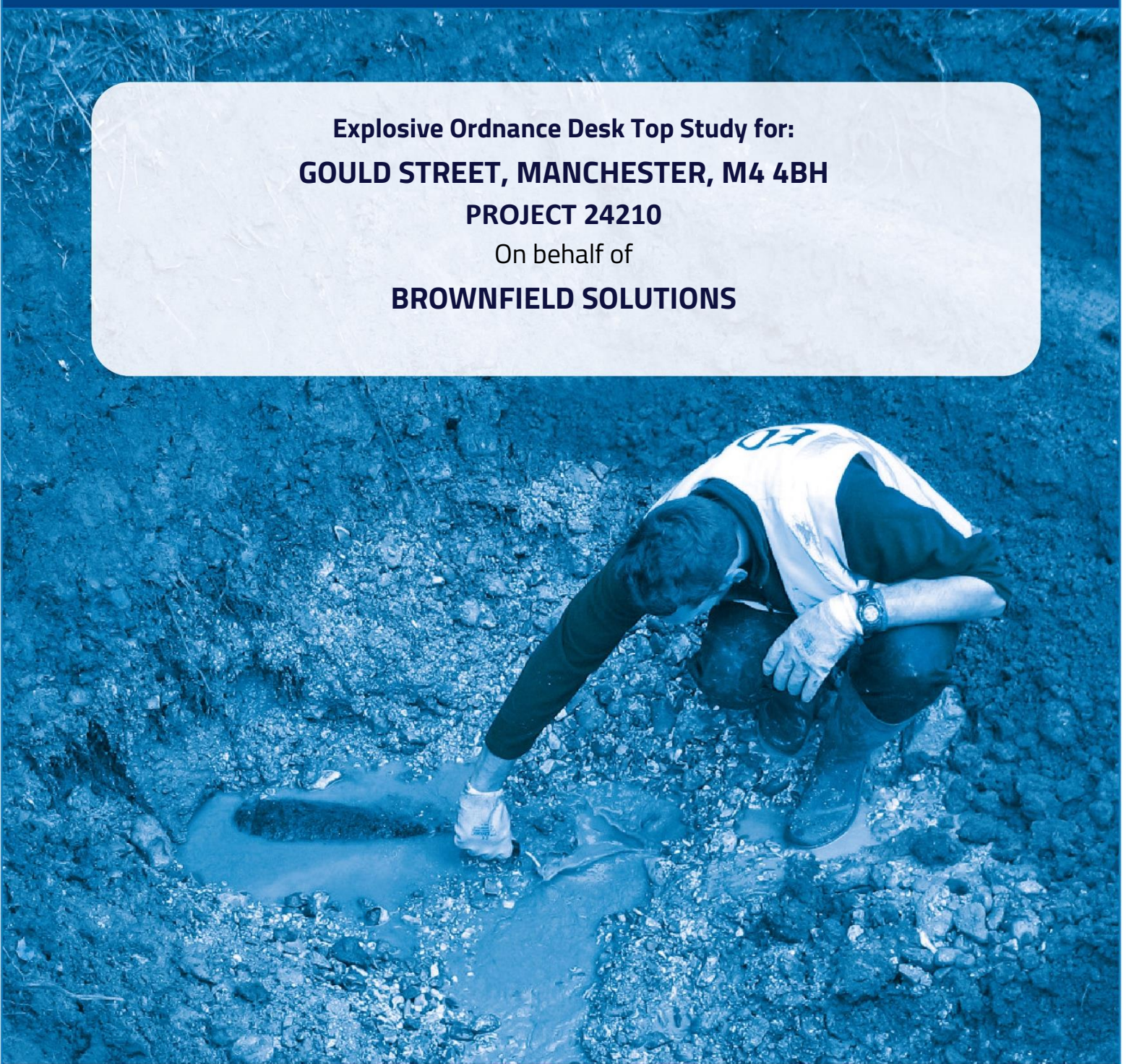
APPENDIX C

UXO Risk Assessment Report



Unexploded Ordnance Risk Mitigation

Explosive Ordnance Desk Top Study for:
GOULD STREET, MANCHESTER, M4 4BH
PROJECT 24210
On behalf of
BROWNFIELD SOLUTIONS



www.eodcontractsLtd.com

Tel: 01386 578 405



EXPLOSIVE ORDNANCE DESKTOP STUDY

For

GOULD STREET, MANCHESTER, M4 4BH

Conducted by **EOD Contracts Limited**

On behalf of **BROWNFIELD SOLUTIONS**

Document Control & Enquiries

Document Reference: EOD/24/24210/DTS/REV1/Gould Street, Manchester, M4 4BH		
DISTRIBUTION COPY 1 (Electronic)		DISTRIBUTION COPY 2 (Electronic)
ARCHIVED		UNCONTROLLED
EOD Contracts Limited Unit 26-28 Kempton Rd Keytec 7 Business Park, Pershore, WR10 2TA		Brownfield Solutions
DOCUMENT ORIGINATOR	Alan Hall	11/06/2024
AUTHORISED RELEASE	Shane Meaker	12/06/2024
All enquiries regarding this document should be directed to: Email: shane.meaker@eodcontractsLtd.com Telephone: 01386 578405 Alternatively, the persons named above can be reached at the above address.		

Conditions of Release

This document was produced in the United Kingdom of Great Britain & Northern Ireland and is copyright © EOD Contracts Ltd. It has been prepared for the titled project, or named part thereof, and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of EOD Contracts Ltd being obtained. EOD Contracts Ltd accepts no responsibility or liability for this document to any party other than the person by whom it was commissioned. To the extent that this report is based on information supplied by other parties; EOD Contracts accepts no liability for any loss or damage suffered by the client, whether contractual or otherwise, stemming from any conclusions based on data supplied by parties other than EOD contracts Ltd and used by EOD contracts Ltd in preparing this report. This document has been produced for the purpose of assessment and evaluation only. The contents of this document shall not in whole or in part: 1. Be used for any purpose other than that for which it was intended, 2. Be disclosed to any individual not having a need to know such information nor to any third party individual, organisation or government, 3. Be stored in any retrieval system nor be reproduced or transmitted in any form by any optical, electronic, mechanical or other means including photocopying, without the prior written permission of EOD Contracts Ltd, 26-28 Kempton Road, Keytec 7 Business Park, Pershore WR10 2TA United Kingdom.

CONTENTS

Title	Pages
Front Cover	i
Document Control & Enquiries	i
Contents Page	ii-iii
Terms and Definitions	iv-v
Executive Summary	viii-x
Risk Map	xi
Bibliography	xii
PART 1: INTRODUCTION	1-2
Instruction	1
Scope of Work	1
Restrictions	1
Sensitive Documentation	2
Objective	2
CIRIA Framework	2
PART 2: SOURCES OF INFORMATION	2-3
Ministry of Defence Records	2-3
Attack Record Keeping	3
Attack Record Accuracy	3
Errors and Omissions	3
PART 3: SITE DESCRIPTION AND DETAILS	4-5
Location	4
Description and Current Usage	5
Geology	5
Future Works	5
PART 4: HISTORICAL REVIEW	6-8
Historical Mapping	6
Post WWII Construction	6
WWI	6
Site Specific Bombing Information	6
WWII	7
Site Specific Bombing Information	7
Abandoned Bombs	7
Anti-Aircraft Artillery	8
Prior Clearance Operations	8
PART 5 SOURCES OF UXO CONTAMINATION	8-9
General	8-9
PART 6 RISK ASSESSMENT	9-11
Risk Assessment	9
Likelihood of Encounter	9-10
Consequences of Encounter	10-11
Risk level	11

Title	Pages
PART 7 CONCLUSIONS	12
Historical UXO Contamination	12
Risk Level	12
PART 8 RECOMMENDATIONS	12-13

Annexes		
Annex A	Location Map	A-1 to A-2
Annex B	Historic Maps	B-1 to B-6
Annex C	WWI Bomb Raids	C-1
Annex D	WW2 Bomb Map	D-1
Annex E	Explosive Ordnance Information and Safety	E-1 to E-10
Annex F	Tables	F-1 to F-4
Annex G	Recent UXO Finds (UK)	G-1 to G-11

TERMS AND DEFINITIONS

Anti-Aircraft Shells (AA)

Small High Explosive Shells (HE) shells ranging up to 100mm in diameter.

Air Raid Precautions (ARP)

An organisation in the United Kingdom set up in 1937 dedicated to the protection of civilians from the danger of air raids. It included the Raid Wardens' Service that was to report on bombing incidents.

Battlefield Area Clearance (BAC)

The systematic clearance of munitions from military property or old battle sites e.g., ranges, airfields etc.

Borehole Search

The placing of boreholes in a set pattern, then using a magnetometer to take readings at specific depths along each borehole. When used with a geophysical survey system this will give a magnetic signature of the area. The depth of the borehole and the pattern will depend upon the type of Unexploded Bombs (UXB) and the geology of the ground.

Doodle Bug (See Pilotless Aircraft)

Explosive Ordnance (EO)

All munitions containing explosives, nuclear fission/fusion materials and or biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket, and Small Arms Ammunition (SAA); all mines, torpedoes, and depth charges; pyrotechnics; clusters and dispensers; cartridge and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices (IED); and all similar or related items or components explosive in nature.

Explosive Ordnance Clearance (EOC)

See BAC.

Explosive Ordnance Disposal (EOD)

The detection, identification, field evaluation, render safe, recovery and disposal of **UXO**.

Geophysical Survey

The survey of an area using a Magnetometer and geophysical gathering device, after interpretation, this will produce a geophysical map and an object list for any metallic anomalies.

High Explosive (HE)

High explosives burn/detonate at rates of up to 9,000 m/per second.

Incendiary Bomb (IB)

Incendiary bombs ranged from 1kg in size to 500kg the larger sizes were sometimes called Oil Bombs. Fills range from thermite mixtures, phosphorus to kerosene.

Intrusive Survey

The use of a cone penetrometer (MagCone) or drilled boreholes (MagDrill) to take magnetometer test in a set pattern (see borehole search), or to prove pile positions.

Land Service Ammunition (LSA)

LSA is defined as “All items containing explosives or pyrotechnic compounds which are placed, thrown, or projected so as to cause damage to men and equipment during land warfare.

Long Range Rocket (LRR)

The long-range rocket sometimes codenamed Big Ben is the V2 rocket designed to deliver an approximate payload of 1000 kg.

Oil Bomb (OB)

A bomb containing a flammable liquid, normally the KC 250 Flam or the C 500 flam.

Pilot less Aircraft (PAC)

A flying bomb (Fly) or doodlebug is the V1 rocket, or predecessors designed to deliver an explosive payload of approximately 500kg - 800kg.

Parachute Mine (PM)

Air dropped mine may have been used as a blast effect bomb maximum explosive content 1600lb always fitted with anti-handling and anti-stripping equipment.

Unexploded Bomb (UXB)

Any air dropped bomb that has failed to operate.

Unexploded Ordnance (UXO)

Explosive ordnance that has been primed, fused, armed, or otherwise prepared for use or used. It may have been fired, dropped, launched, or projected yet remains unexploded either through malfunction or design or for any other cause.

Vengeance Weapons (V)

V1 see Pilotless Aircraft.

V2 see Long Range Rocket.

WWI

World War 1 (1914 – 1918)

WWII

World War 2 (1939 – 1945)

EXECUTIVE SUMMARY

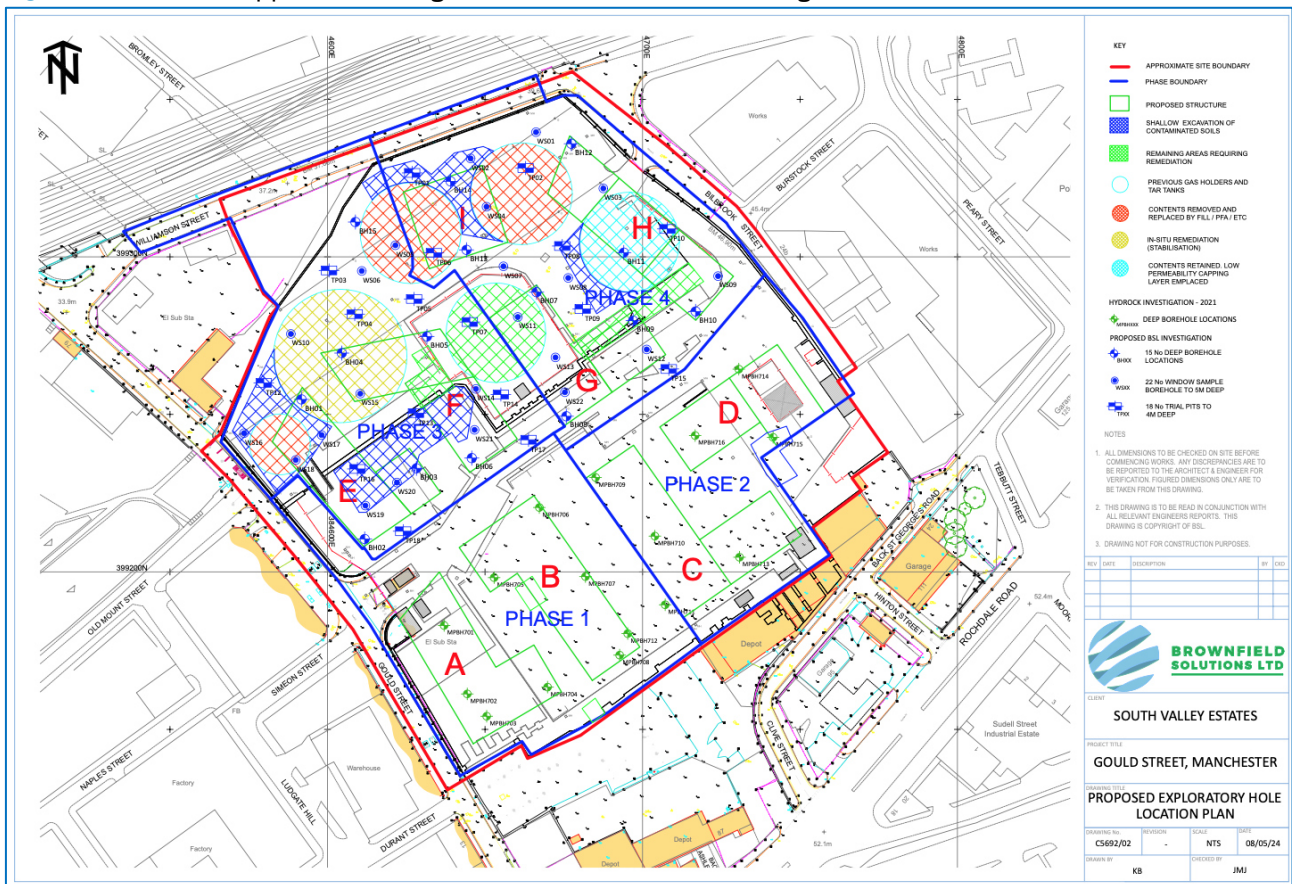
INSTRUCTION

EOD Contracts Ltd, have been commissioned by Brownfield Solutions to undertake a Provisional Desktop Study (PDTs) for potential historic Unexploded Ordnance (UXO) contamination for the future works at Gould Street, Manchester, M4 4BH, hereafter referred to as the Site.

SCOPE OF WORK

The scope of this EO Risk Assessment/Desk Study is to assess the likelihood of buried EO/UXO within the environs of The Site (See Figure 1.1), in view of further development. A further aim was to evaluate the implication from UXO contamination during any future intrusive land use.

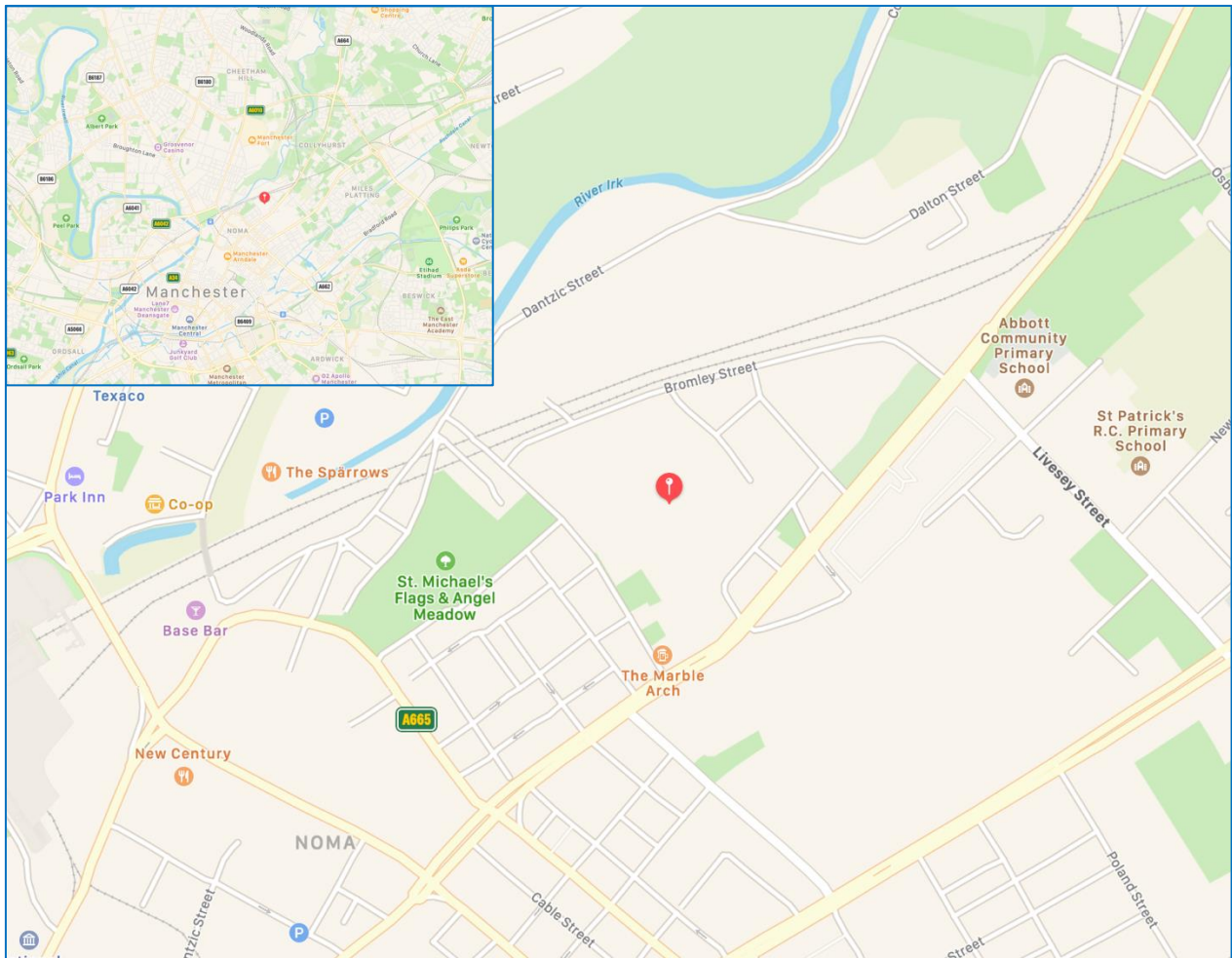
Figure 1.1: Clients Supplied Site Diagram, This DTS will be covering the area bordered in RED.



LOCATION

Site Location (red flag). An exact meeting point will be determined by the Client should the need arise.

Table 3.1 Site Location.



Title	Description
Address	Gould Street, Manchester,
Post Code	M4 4BH
Nat Grid Reference	SJ 846992 / SJ 8468599234
what3words	mirror.cars.hotel

SOURCES OF UXO CONTAMINATION

The main sources of potential UXO contamination that have been researched for the site are:

- Buried or discarded items of ordnance.
- Air delivered ordnance bombs and sub-munitions/incendiaries.

KEY FINDINGS

Based on the information researched by EOD Contracts Ltd for the proposed scope of works being carried out within the given Site area, the following conclusions have been reached:

- The Site area is situated within Manchester, which is off historic fact was bombed on several occasions throughout WW2, the worst of which being the Christmas raids. However, despite this it is situated away from the centre of Manchester which is where the focus of the raids took place.
- The Site was subjected to bombing throughout WW2 as can be seen in Annex D.
- The Site area was fully utilised throughout WW2.
- The Site would have been considered a viable and strategic target throughout this period.
- There have been several phases of construction and remediation works that have taken place within the Site boundary post WW2. However, it cannot be guaranteed that these remediation works went to protentional bomb penetration depth.

Risk Level

The prevailing risk level has been determined to be **LOW** for some areas within the Site boundary and **MEDIUM** for others (see risk map).

Historical UXO Contamination

The indicators for UXO contamination are:

Bomb Strikes	There are no recorded incidents of the site being the subject of bombardment throughout WW1. Manchester was targeted heavily throughout WW2. The Site would have been considered a strategic target throughout this period. Known bomb strikes within the Site boundary. There have been several phases of construction and remediation works that have taken place within the Site boundary. The Site was fully utilised throughout WW2.
Bomb Damage	Difficult to ascertain.
Reconstruction	No obvious signs
Military Usage	No obvious signs.
Explosive/Munition Factory	No obvious signs

Risk Level	Therefore, so far as reasonably practicable the risk level on Site has been deemed as both a LOW risk and MEDIUM risk for some areas. See risk map.
Risk Depth	7.062 for areas deemed a MEDIUM risk

PART 8: RECOMMENDATIONS

It is recommended that the following risk mitigation strategy be executed during phases of the project indicated previously as a **LOW** risk.

UXO safety awareness training should be given at all levels of site personnel and selected individuals on the project staff with relevant responsibilities. A competent person as part of the project safety induction course should provide the awareness training. It should be reinforced with specific safety briefings and toolbox talks to individuals involved in conducting intrusive earthworks.

It is recommended that the following risk mitigation strategy be executed during phases of the project indicated previously as a **MEDIUM** risk.

Communicating the risks, all stakeholders should be made aware of the UXO situation on the site and the possible impact it may have on the project works and day to day running of the district. Clients have a legal duty under the Construction Design & Management Regulations (CDM) and Health & Safety at Work legislation to provide Designers and Contractors with project specific information needed to identify hazards and risks associated with the design and construction work. The possibility that UXO may be encountered on site falls within the category of a significant risk and as such it should be addressed as early as possible in the lifecycle of the project.

Further planning: the risks posed by UXO should be brought to the attention of the Project CDM Coordinators and other individuals with a responsibility for project safety and operations at the site. The matter of UXO should be considered critical to project safety and one requiring high priority action.

UXO safety awareness training should be given at all levels of site personnel and selected individuals on the project staff with relevant responsibilities. A competent person as part of the project safety induction course should provide the awareness training. It should be reinforced with specific safety briefings and toolbox talks to individuals involved in conducting intrusive earthworks.

Project overview and the responsibilities of those working on site with regard to duty of care and public safety.

UXO recognition and safety procedures to be followed on discovery of a suspicious object or the alarm being sounded.

Emergency procedures to be followed in the event of an explosion. Evacuation routes, muster stations and accounting for personnel.

Work permits, works methodology and specific UXO risk mitigation methods. Post-incident inspections and returning to normal works.

Prior to any intrusive piling or drilling commencing, UXO safety testing and appropriate clearance certification into the ground to sufficient depth to provide clearance from UXO. This can be done using a progressive drilling process or (where large numbers of piles are to be placed and ground permitting)

using a vehicle borne hydraulic system to push a magnetometer into the ground to test for the presence of UXO prior to piling.

UXO safety monitoring of all "at risk" excavations, including geotechnical or archaeological trial pits to be conducted during the project. This should be provided by a UK Home Office Authorised EOD/UXO Contractor using qualified EOD Engineer with specialist locators and detectors to scan the ground ahead of the excavation wherever possible.

9.0: SPECIFICALLY

Geotechnical investigations, percussive drilling/trial pits/window/samples, require an EOD Engineer over watch.

The removal of all buildings within the site footprint can be removed down to ground level (including basements)

New foundations with piling should be mitigated by the insertion of a magnetometer to encompass the pile position, this would be carried out using a CPT rig (magcone), the expected radius of the magcone is 1.5m therefore multiple piles could be checked.

Non-Intrusive Magnetometer surveys generally prove inconclusive on "Brownfield sites", this is due to the high ferromagnetic background, therefore this methodology is not recommended for this site and shallow excavations should be overseen by a qualified EOD Engineer.

10: RISK MAP

Due to the Site being subjected to several known bomb strikes throughout WW2, areas of the northern half of the Site has been deemed a **MEDIUM** risk. This area has been subjected to post war excavation works however, it cannot be guaranteed to at a depth below potential bomb penetration depth.



EOD Contracts Ltd can supply a turnkey solution to your UXO requirements. Therefore, the following mitigation strategies can be supplied for land or water-based operations:

Intrusive survey using CPT (*Cone Pressure Testing*) or borehole equipment, *supplying risk mitigation to all Borehole and Pile locations, down to a maximum bomb penetration depth determined within this document.*

Non-Intrusive Survey using multiple array system with DGPS (*Differential Global Positioning System*).

Offshore, near-shore, estuarine and freshwater water environments magnetic, side scan and bathymetric supported by state-of-the-art DGPS.

The aforementioned surveys are supported with post processing of data and intrusive investigations if required.

EOD Engineer over watch using Suitably Qualified and Experienced Personnel, normally former British Army, Navy, or RAF Bomb Disposal specialists.

Explosive Ordnance Safety Presentations.

Bibliography

The significant published documents referred to during this study are listed below:

- HO 193 series from National Archives
- HO 198 series from National Archives
- The Blitz Then and Now Volumes 1 to 3
- AA Command Colin Dobinson
- German Air Raids on Britain 1914-1918
- English Heritage
- Bombing Britain Database
- <https://luna.manchester.ac.uk/luna/servlet/view/search?q==%22GB127.MISC%2F1192%2F1%22>
- <https://www.ashremediation.co.uk/portfolio/gould-street-gasworks-2/>
- <https://www.manchestereveningnews.co.uk/news/greater-manchester-news/manchester-blitz-bomb-sites-map-10465447>
- <https://www.derelictmanchester.com/p/derelict-viaduct-near-gouldback-georges.html#gsc.tab=0>
- <https://www.manchestereveningnews.co.uk/news/greater-manchester-news/gould-street-gasworks-site-could-18757500>
- <https://manchesterhistory.net/manchester/gone/gouldgasworks.html>
- <https://aboutmanchester.co.uk/work-has-begun-on-site-of-former-gasworks-on-rochdale-road/>
- <https://www.placenorthwest.co.uk/mcr-ready-to-move-on-1200-home-manchester-resi/>
- <https://mcrproperty.com/2021/06/04/manchesters-400million-gasworks-new-town-scheme-gets-green-light-for-1200-homes/>
- <https://www.manchestereveningnews.co.uk/news/greater-manchester-news/what-happen-east-manchesters-iconic-14011886>

PART 1: INTRODUCTION

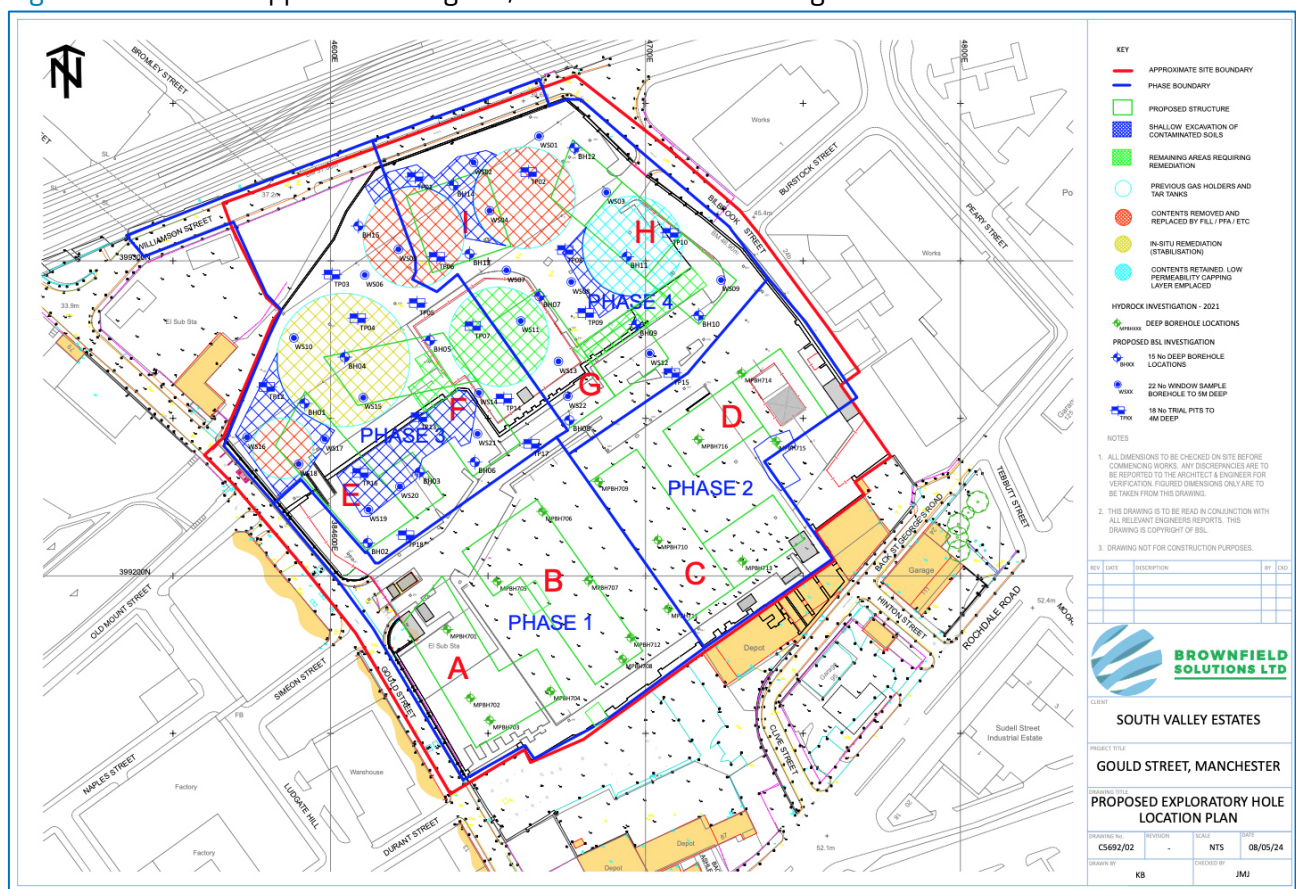
Instruction

EOD Contracts Ltd, have been commissioned by Brownfield Solutions to undertake a Provisional Desktop Study (PDTs) for potential historic Unexploded Ordnance (UXO) contamination for the future works at Gould Street, Manchester, M4 4BH, hereafter referred to as the Site.

Scope of Work

The scope of this EO Risk Assessment/Desk Study is to assess the likelihood of buried EO/UXO within the environs of The Site (See Figure 1.1), in view of further development. A further aim was to evaluate the implication from UXO contamination during any future intrusive land use.

Figure 1.1: Clients Supplied Site Diagram, This DTS will be covering the area bordered in RED.



Restrictions

It must be emphasized that a desk study can only indicate the potential for UXO to be present on the site. This study was written with the site conditions prevailing at the time of the study and no liability can be accepted for any change in the condition of the area.

Please note that our appraisal relies on the accuracy of the information contained in the documents consulted and that EOD Contracts Ltd will in no circumstances be held responsible for the accuracy of such information or data supplied.

Sensitive Documentation

Information may be classified, restricted, or deemed to be confidential in nature to EOD Contracts Limited, where such material has been gained a summary of the documentation has been approved.

Objective

The objective of this document is to define the UXO contamination routes as defined in Unexploded ordnance (UXO) A guide for the construction industry (C681) dated July 2009 and offer remediation methodologies if required.

CIRIA Framework

The CIRIA report is intended to provide good practice guidance (code of practice) on how to identify whether a site is likely to be at significant risk of UXO encounter and, if so, to set-out a process that will allow this risk to be managed. To be effective this process must start early in the life of the project (usually before intrusive works commence) and have involved Clients, Advisors and Principal Contractors. Therefore, the ground contractor should be provided with a systematic appraisal of the UXO risk when they become involved. The CIRIA report recommends the following stages be undertaken as part of the risk management process:

- Phase 1 Preliminary Risk Assessment
- **Phase 2 Detailed Risk Assessment (Completed and updated in this document)**
- Phase 3 Risk Mitigation (The act of ameliorating the risk, the clearance methodology)
- Phase 4 The UXO Risk Management and Implementation Plan

PART 2: SOURCES OF INFORMATION

Research of the site's history, with regard to military usage, bombing raids and bomb impacts has been undertaken to establish the following:

- Frequency and intensity of enemy bombing raids for the site and immediate vicinity up to 500m.
- Bomb impacts and associated damage on the Site and in the immediate vicinity.
- The potential for UXO to remain on the Site and in the vicinity.
- Records of UXO removal activities for the Site and immediate vicinity.
- The main sources of information consulted include:
 - a. EOD Contracts Ltd company records
 - b. Ministry of Defence records
 - c. Central and Local Government Records
 - d. Public Records Office (Kew)
 - e. Historic Maps and Air Photography
 - f. Open-Source information (Internet)

Ministry of Defence (MOD) Records

33 Engineer Regiment (Explosive Ordnance Disposal) Royal Engineers is the unit responsible for maintaining the records concerning conventional Bomb incidents, reports, clearances and related UXO

matters. These records are known to be incomplete and are no longer supplied. Based on in-house information released by the MOD previously, it is considered unlikely that any information released will have any significant impact on the findings of this study.

Attack Record Keeping

In general, the quality and accuracy of bombing and shelling records prior to 1942 varied greatly from one region to another. Records relating to the limited air attacks on the United Kingdom are considered to be sufficiently accurate in urban areas to provide a reasonable level of confidence in determining the likelihood that an area was or was not bombed during this period. Wartime records, maps etc held within the civil archives are considerably more comprehensive than those still in existence within the MOD, where it is acknowledged that large numbers of records have been disposed of since 1945. Records from some areas, particularly rural districts or near large bodies of water should still be regarded as an incomplete picture of the extent and effect of the bombing campaign.

Attack Record Accuracy

While an Air Raid was in progress it was inevitable that mistakes would be made in the transcription of rushed verbal reports into the written records. Discrepancies did occur between the total of bombs dropped against detonations witnessed. In some cases, records were made several hours after the event and mistakes were inevitable. Some reports were drafted before the full extent of the raid had been determined which has led to significant omissions in the records. Reports of raids on rural areas were often witnessed and submitted by untrained individuals and passed through third parties before being recorded. Suspect UXBs occasionally went unreported by local farmers and freeholders who saw the event as insignificant or were reluctant to report their findings for fear of valuable land or crops being destroyed by the authorities in their attempts to find the UXB. It should also be noted that bomb strikes in water were notoriously difficult to spot, particularly if the bomb had failed to detonate. As a result, bomb record accuracy in areas containing large bodies of water or marshland is considered to be questionable.

Errors and Omissions

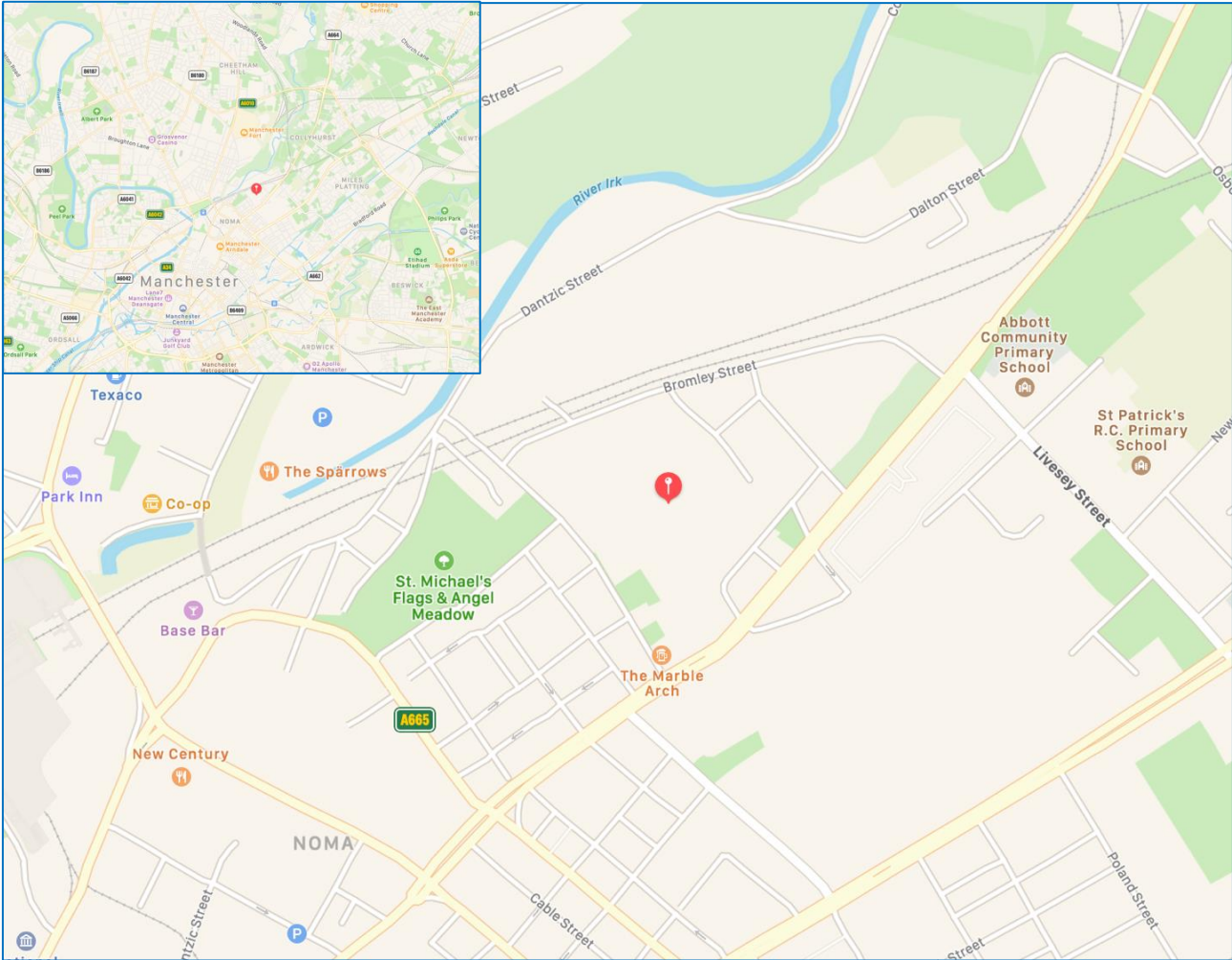
The accuracy of bombing records has been shown to vary greatly; this may have been a result of the individual record keeper's expertise. Additionally, in some cases, errors occurred as a result of poor or incomplete transcription and copying. Some "errors and omissions" were intentional, designed to serve as dis-information to confuse German intelligence. So long after the event, official verification of such incidents has often proven to be impossible to obtain. At present, UXBs are found on construction sites and other locations where there had been no documentary evidence to suggest their presence. These events, although infrequent, do serve as confirmation that records cannot be considered definitive.

PART 3: SITE DESCRIPTION AND DETAILS

Location

The Location (red flag). An exact meeting point will be determined by the Client should the need arise.

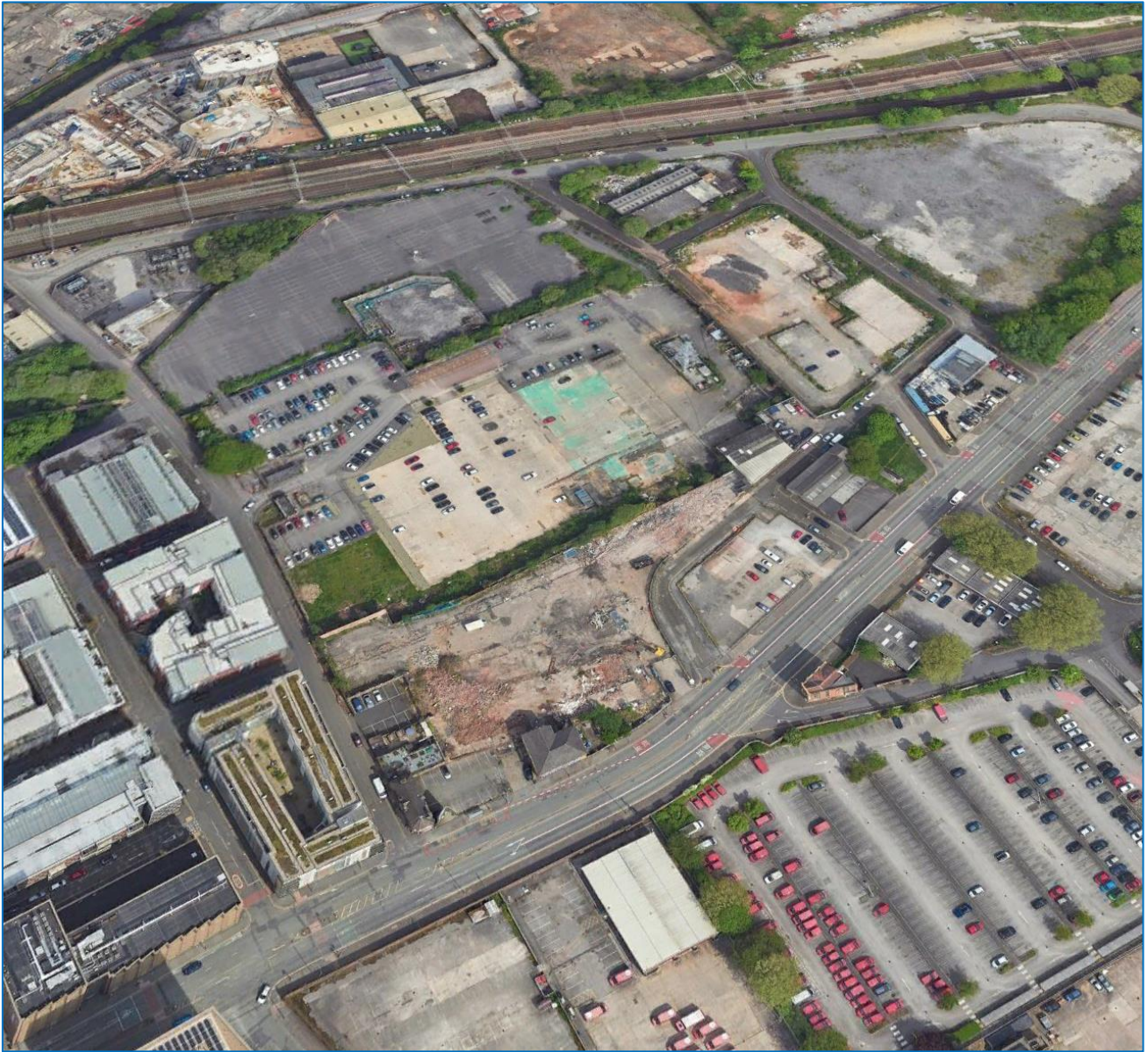
Table 3.1 Site Location.



Title	Description (Centre of Site)
Address	Gould Street, Manchester,
Post Code	M4 4BH
Nat Grid Reference	SJ 846992 / SJ 8468599234
what3words	mirror.cars.hotel

Description and Current Usage

PHOTO 3.1: The Site at present is still fully utilised. However, its only use is as a “off street” carpark. All former buildings have been demolished to ground level.



Geology

BGS (British Geological Survey) indicates the following geology.

Wilmslow Sandstone Formation - Sandstone. Sedimentary bedrock formed between 252.2 and 247.1 million years ago during the Triassic period.

Future Works

At the time of writing this report it is understood that the site will be subjected to some form of redevelopment (the exact scope of works is not known at this time). The supplied requirement is usually for, geotechnical investigations, possibly percussive drilling/trial pits/window/samples.

PART 4: HISTORICAL REVIEW

Historical Mapping

The historical maps in Annex B have been reviewed and a brief synopsis is in Table 4.1:

Table 4.1 Historical Map Synopsis

Date	Scale	Description/Remarks
1922 - 1933	1:2,500	The Site pre-WW2 lies within a well-established built-up area and is both residential and Industrial in nature. Within the Site boundary lies "Rochdale Road Gas Works" which includes three gas holders as well as four large sheds with rail lines used for loading/offloading. There are also several smaller ancillary buildings whose exact usage cannot be determined but can be assumed to form part of the infrastructure required for the Gas Holders.
1948 - 1949	1:1,250	For the most part the Site remains unchanged except for the southeast corner where one of the sheds has been removed and replaced with a conveyor.
1968 - 1990	1:1,250	There has been post war development that has taken place within the Site boundary. The three gas holders remain unchanged. However, the three sheds/conveyor and rail lines have been removed and replaced with one large building which occupies the entire southern half of the Site area.
1992	1:1,250	Further development has taken place within the Site boundary. The Site is now titled as a "depot". It appears that the entire Site has undergone change, this includes both the large building that occupied the Southern half of the Site and the removal of the three Gas Holders.
2024	1:10,000	Further changes have taken place within the Site boundary. All former buildings have been reduced to ground level. The Site at present is being utilised as an "off road" carpark.

Post War Construction/Works

There have been several stages of post WW2 construction as previously stated. Additionally, there has also been post war remediation works carried out in order to clear contaminated ground, particularly in and around the former gas holders.

SOURCE: <https://www.ashremediation.co.uk/portfolio/gould-street-gasworks-2/>

WWI

Although many people associate wartime bombing with The Blitz during World War II, the first airborne terror campaign in Britain took place during the First World War. Air raids in World War One caused significant damage and took many lives. German raids on Britain, for example, caused 1,413 deaths and 3,409 injuries.

Site Specific Bombing Information

There is no evidence to suggest that the Site was targeted throughout this period.

WWII

Bombing started as early as October 1939, by the end of the WWII the Luftwaffe had dropped approximately 50,000 tonnes of high explosive bombs and 110,000 tonnes of incendiary bombs, this caused over 40,000 UXBs, killed 43,000 people and over 250,000 homes were destroyed.

Manchester (the Site) Throughout WW2

Manchester and its surrounding area were a major centre of industry during the Second World War. Many large firms were concentrated in the Trafford Park area, making it an important target for the Luftwaffe. Major producers included the aircraft manufacturers A V Roe that produced Manchester and Lancaster Bombers; Ford also employed 17,000 workers making aero engines in a huge new factory complex. During the raids on 22nd – 24th December 1940, the Metropolitan-Vickers works in Mosley Road was just one of the areas factories that was badly damaged. In a later raid 1n 1941 Manchester United's Stadium was hit by a bomb and remained out of action till 1949.

Manchester was attacked on the night of 22nd – 23rd December and again the following night of 23rd – 24th December 1940 (the Christmas raids). On the first night of the raids over 272 tons of HE Bombs was dropped, followed the next night by a further 195 tons. In cooperation to this the Luftwaffe also dropped around 2000 Incendiary bomblets across the city.

Additionally, to these raids, Manchester also suffered smaller attacks, including one in June 1941 when the Blitz was thought to be over. The city had three major raids over the Blitz period (a major raid being defined when over 100 tons of HE Bombs have been dropped) in total, more than 578 tons of explosives were aimed at the city making it the 11th most heavily raided city in Britain.

During the Christmas Raids over 600 fires were started by Incendiary bombs, unfortunately the majority of these were allowed to burn causing further damage. This was due to the cities 3,500 full and part time fire fighters had not returned from Liverpool where they had been sent several days before to help fight fires caused by previous raids. In some cases, the Army was utilised to demolish surrounding buildings to stop the fire from spreading further. Some of the fires continued to burn throughout the day on the 23rd December, providing a beacon for the German Luftwaffe upon its return that night.

So far as the city's infrastructure was concerned, following the Christmas raids both of Manchester's railway stations had been hit, as were the major bus stations. Deansgate and Oxford Road were blocked by debris from damaged buildings; bomb craters and UXBs meant that whole sections of the city had to be cordoned off. Water supplies were also affected, and electricity was rationed.

As can be seen within the Bomb Map in Annex D there does appear to have been at least four bomb strikes within the Site boundary itself, including strikes on the Gas holders themselves.

Abandoned Bombs/UXO

EOD Contracts records could find no evidence of any abandoned Bombs in or around the subject Site.

Anti-Aircraft Artillery

There is no recorded evidence of the site being utilised for this purpose.

Explosive or Munition Factories

No explosive or munition factories were noted.

Military Usage

No records that indicate that the site has served any military purpose other than as a supply depot, as previously highlighted.

Prior Clearance Operations

EOD Contracts could find no evidence to suggest that there have been any prior UXO clearance operations in or around the site footprint.

PART 5: SOURCES OF UXO CONTAMINATION

The main sources of UXO contamination that have been researched for the site are:

Air delivered ordnance bombs and sub-munitions/incendiaries.

- Anti-Aircraft Ammunition (AA)
- Air delivered ordnance bombs and sub-munitions/incendiaries.

General

UXO contamination pathways from:

- Air delivered ordnance bombs between 100m and 200m.
- The nearest Anti-Aircraft Weapons (AA) is over 3km.
- No recorded use as an Explosive or Munition Factory
- Has had no Military Usage

UXOs are essentially dangerous; therefore, further information on UXO and Safety is detailed in Annex D.

Bomb Penetration Depths

The weapon penetration depths have been assessed as part of the tables in Annex D.

Factors Affecting Penetration

The penetration of sub-surface bombs will be affected by the following:

- Height of release
- Weight, shape, and design of bomb
- Aerodynamic qualities
- Angle of flight and impact
- Nature of impact surface
- Nature of sub soil

The expected bomb depths for the site assuming the following criteria:

- 15,000 feet, the vast majority of bombs were dropped from height to avoid AA fire and balloons.
- General Purpose Bombs of 50kg to 1000kg
- Near Vertical impact 80 to 90 degrees
- Surface geotechnical conditions are made ground.
- Subsurface geotechnical conditions are generally clays.

Therefore, the expected depths for Air dropped UXBs on site are indicated in RED in the following table:

TABLE 5.1: Bomb Penetration Depths

Sub-Soil Type	Bomb Weights			
	50kg	250kg	500kg	1000kg
Soft Rock	2.442	5.016	6.006	7.062
Gravel	2.442	5.016	6.006	7.062
Sand	2.442	5.016	6.006	7.062
Chalk	3.7	7.6	9.1	10.7
Shingle	3.7	7.6	9.1	10.7
Dry Clay	3.7	7.6	9.1	10.7
Wet Sand	5.55	11.4	13.65	16.05
Wet Clay	5.55	11.4	13.65	16.05
Average Offset (m)	0.8-1.6	1.6-3.7	3-4.5	3.4-5.3

PART 6: RISK ASSESSMENT

Risk Assessment

Assessing both the likelihood of occurrence and the consequences of the encounter has derived the overall risk for the site from unexploded ordnance. Review of the Site's history and geographic location can provide an overall likelihood of encounter factor, which is used in the subsequent determination of a risk level when a Figure can be determined for the consequence.

Likelihood of Encounter

Given the study findings and other criteria (see Annex E Tables) it is considered that there is a **LOW/ MEDIUM** risk of encountering UXO within the Site footprint. This finding is based on assessment of all of the available information and taking account of the following factors:

- The Site area is situated within Manchester, which is off historic fact was bombed on several occasions throughout WW2, the worst of which being the Christmas raids. However, despite this it is situated away from the centre of Manchester which is where the focus of the raids took place.
- The Site was subjected to bombing throughout WW2 as can be seen in Annex D.
- The Site area was fully utilised throughout WW2.
- The Site would have been considered a viable and strategic target throughout this period.

- There have been several phases of construction and remediation works that have taken place within the Site boundary post WW2. However, it cannot be guaranteed that these remediation works went to protentional bomb penetration depth.
- Encounters of UXO are not uncommon, recent UXO finds are in Annex E.

Consequence of Encounter

The consequence (see Annex D) of an uncontrolled encounter with UXO, given its lethal design and its unpredictable nature could be catastrophic and warrants a high severity factor. With regards to the consequences, the following factors were considered:

The project works may make use of a number of common ground investigation and construction techniques in its methodology during the project. Any intrusive groundwork has the potential to encounter UXO.

Intrusive earthwork, piling driving and dynamic ground compaction are by nature, aggressive, significant force (kN) is often required to achieve the desired results. As a precaution it is prudent to assume that any external stimulus, no matter how slight, may result in an unstable weapon detonating.

Records of encounters with UXO, particularly where plant machinery has been involved have resulted in detonations of the items with varying degrees of consequence; ranging from slight injuries sustained to piling contractors when a bomb detonated at 6.0m bgl to fatal injuries sustained to a construction worker while conducting near surface machine works on a motorway.

Detonation on land; the effects of a detonation at depth will be more localised and less destructive than one occurring on the surface. Figure 6.1 shows an illustration of the primary blast and fragmentation dispersal from explosive ordnance when it detonates on the surface. The weapon's design, and other key factors such as the ratio of explosive charge weight to total weapon weight (CWR) and the Net Explosive Quantity (NEQ) will determine the size and effects of a blast. The effects will also be enhanced or reduced by a number of factors including, the presence of other energetic materials in close proximity to the blast or if the weapon is buried or exposed on the surface. As a guide Annex E Table 1 gives an indication of the likely blast radius for common types of UXO.

Figure 6.1: Primary Blast & Fragmentation on Land



In addition to the dangers of explosion, many common chemicals used in the manufacture of explosive ordnance fillings are in sufficient quantity, and level of exposure, toxic or poisonous. Although it is unlikely that such chemicals would be encountered in significant quantity to represent a significant risk to personnel, leakage or venting could pose a risk to the local marine environment. In addition to heavy metals, copper, lead, zinc etc used in the weapon body and fuze, hydrocarbon propellants such as Kerosene may also be present.

Risk Level

The prevailing risk level has been determined to be **LOW** within the Southern half of the Site area and a **MEDIUM** risk in the northern half. (See Risk Map)

PART 7: CONCLUSIONS

Based on the information researched by EOD Contracts Ltd for the proposed scope of works being carried out within the given site area, the following conclusions have been reached:

Historical UXO Contamination

The indicators for UXO contamination are:

Bomb Strikes	There are no recorded incidents of the site being the subject of bombardment throughout WW1. Manchester was targeted heavily throughout WW2. The Site would have been considered a strategic target throughout this period. Known bomb strikes within the Site boundary. There have been several phases of construction and remediation works that have taken place within the Site boundary. The Site was fully utilised throughout WW2.
Bomb Damage	Difficult to ascertain.
Reconstruction	No obvious signs
Military Usage	No obvious signs.
Explosive/Munition Factory	No obvious signs

Risk Level

The overall risk has been determined to apply to all ground works within the site footprint.

Risk Level	Therefore, so far as reasonably practicable the risk level on Site has been deemed as both a LOW risk and MEDIUM risk for some areas. See risk map.
Risk Depth	7.062 for areas deemed a MEDIUM risk

PART 8: RECOMMENDATIONS

It is recommended that the following risk mitigation strategy be executed during phases of the project indicated previously as a **LOW** risk.

UXO safety awareness training should be given at all levels of site personnel and selected individuals on the project staff with relevant responsibilities. A competent person as part of the project safety induction course should provide the awareness training. It should be reinforced with specific safety briefings and toolbox talks to individuals involved in conducting intrusive earthworks.

It is recommended that the following risk mitigation strategy be executed during phases of the project indicated previously as a **MEDIUM** risk.

Communicating the risks, all stakeholders should be made aware of the UXO situation on the site and the possible impact it may have on the project works and day to day running of the district. Clients have a legal

duty under the Construction Design & Management Regulations (CDM) and Health & Safety at Work legislation to provide Designers and Contractors with project specific information needed to identify hazards and risks associated with the design and construction work. The possibility that UXO may be encountered on site falls within the category of a significant risk and as such it should be addressed as early as possible in the lifecycle of the project.

Further planning: the risks posed by UXO should be brought to the attention of the Project CDM Coordinators and other individuals with a responsibility for project safety and operations at the site. The matter of UXO should be considered critical to project safety and one requiring high priority action.

UXO safety awareness training should be given at all levels of site personnel and selected individuals on the project staff with relevant responsibilities. A competent person as part of the project safety induction course should provide the awareness training. It should be reinforced with specific safety briefings and toolbox talks to individuals involved in conducting intrusive earthworks.

Project overview and the responsibilities of those working on site with regard to duty of care and public safety.

UXO recognition and safety procedures to be followed on discovery of a suspicious object or the alarm being sounded.

Emergency procedures to be followed in the event of an explosion. Evacuation routes, muster stations and accounting for personnel.

Work permits, works methodology and specific UXO risk mitigation methods. Post-incident inspections and returning to normal works.

Prior to any intrusive piling or drilling commencing, UXO safety testing and appropriate clearance certification into the ground to sufficient depth to provide clearance from UXO. This can be done using a progressive drilling process or (where large numbers of piles are to be placed and ground permitting) using a vehicle borne hydraulic system to push a magnetometer into the ground to test for the presence of UXO prior to piling.

UXO safety monitoring of all "at risk" excavations, including geotechnical or archaeological trial pits to be conducted during the project. This should be provided by a UK Home Office Authorised EOD/UXO Contractor using qualified EOD Engineer with specialist locators and detectors to scan the ground ahead of the excavation wherever possible.

9.0: SPECIFICALLY

Geotechnical investigations, percussive drilling/trial pits/window/samples, require an EOD Engineer over watch.

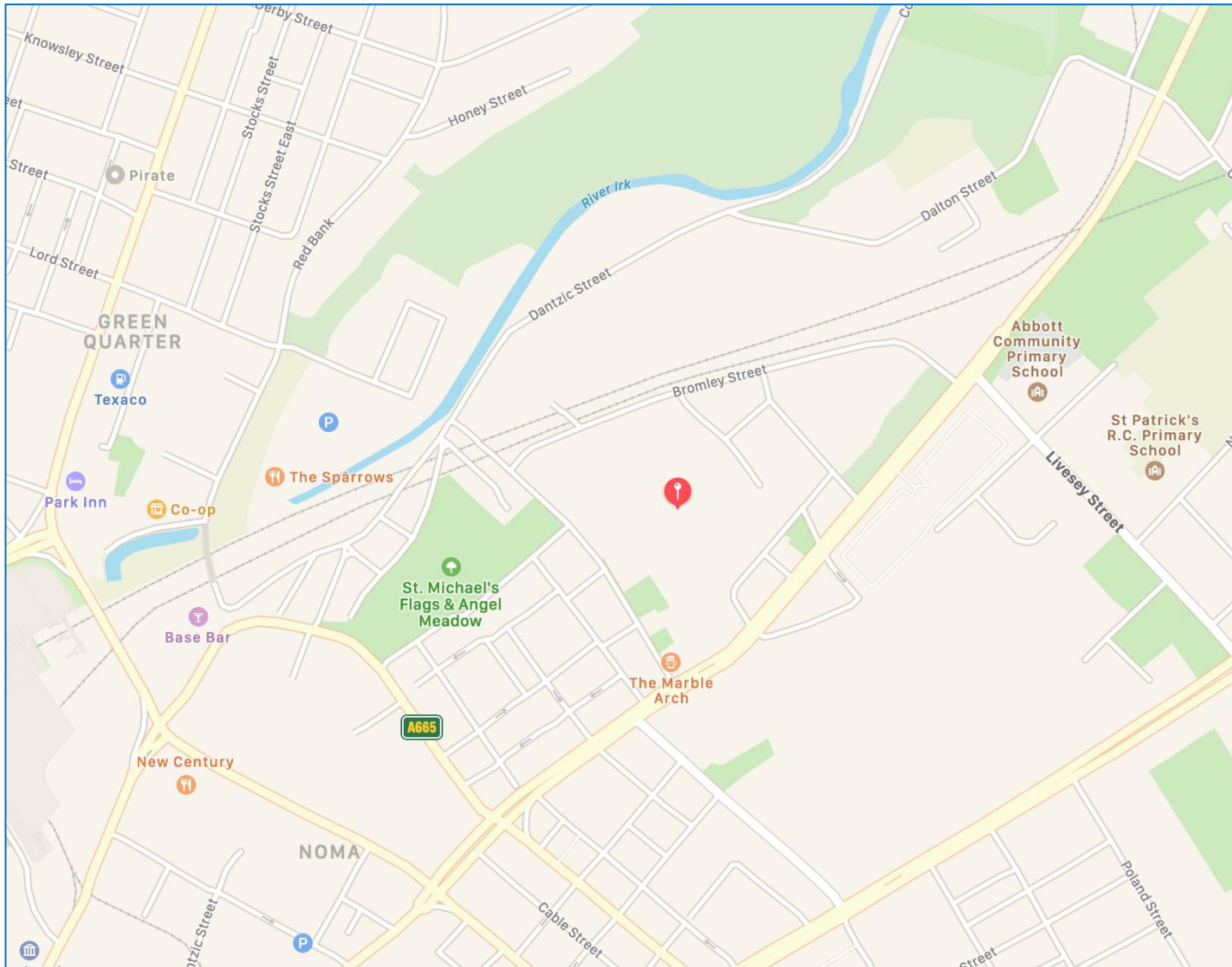
The removal of all buildings within the site footprint can be removed down to ground level (including basements)

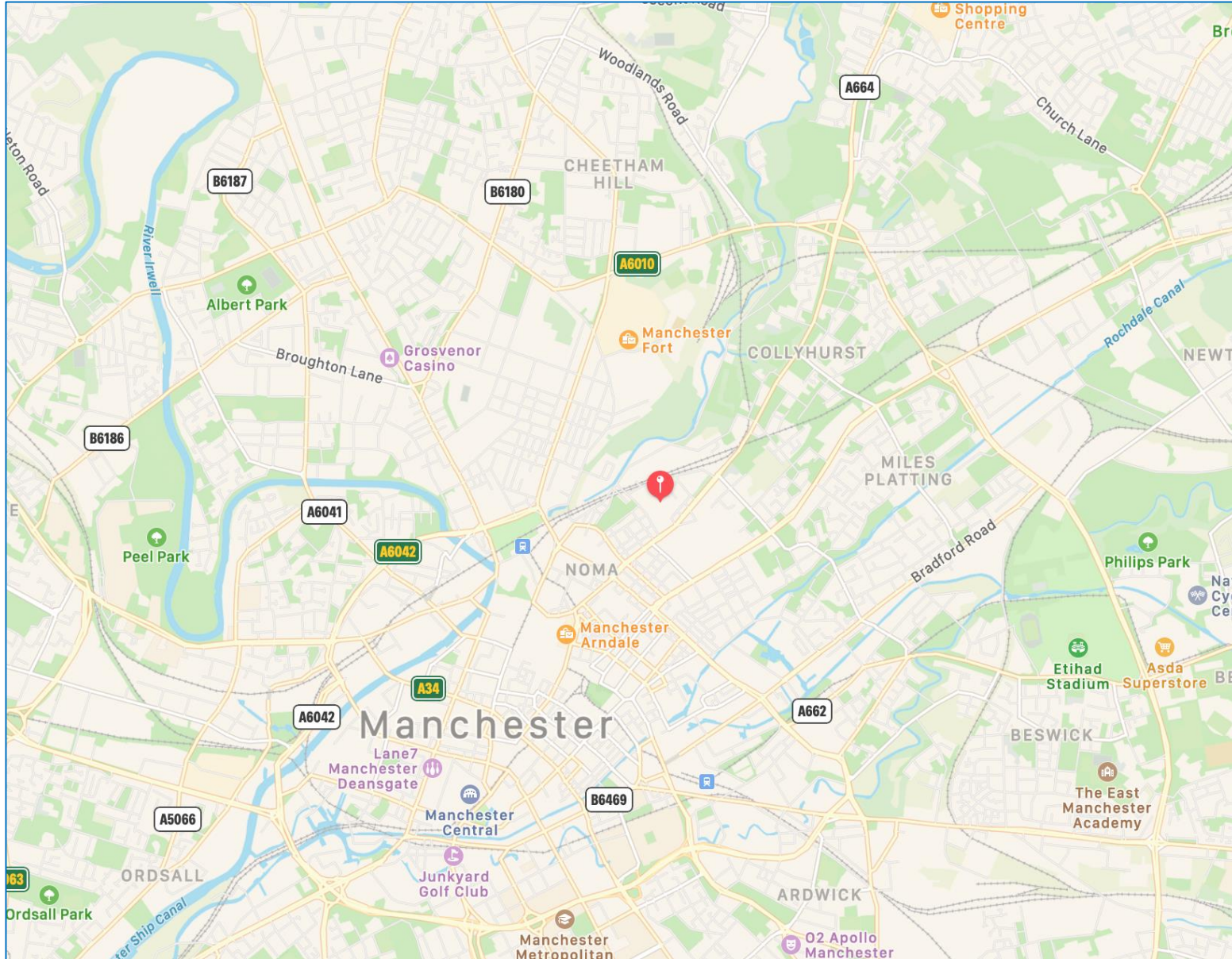
New foundations with piling should be mitigated by the insertion of a magnetometer to encompass the pile position, this would be carried out using a CPT rig (magcone), the expected radius of the magcone is 1.5m therefore multiple piles could be checked.

Non-Intrusive Magnetometer surveys generally prove inconclusive on "Brownfield sites", this is due to the high ferromagnetic background, therefore this methodology is not recommended for this site and shallow excavations should be overseen by a qualified EOD Engineer.

SITE LOCATION

The Site Location (red flag). An exact meeting point will be determined by the Client should the need arise.

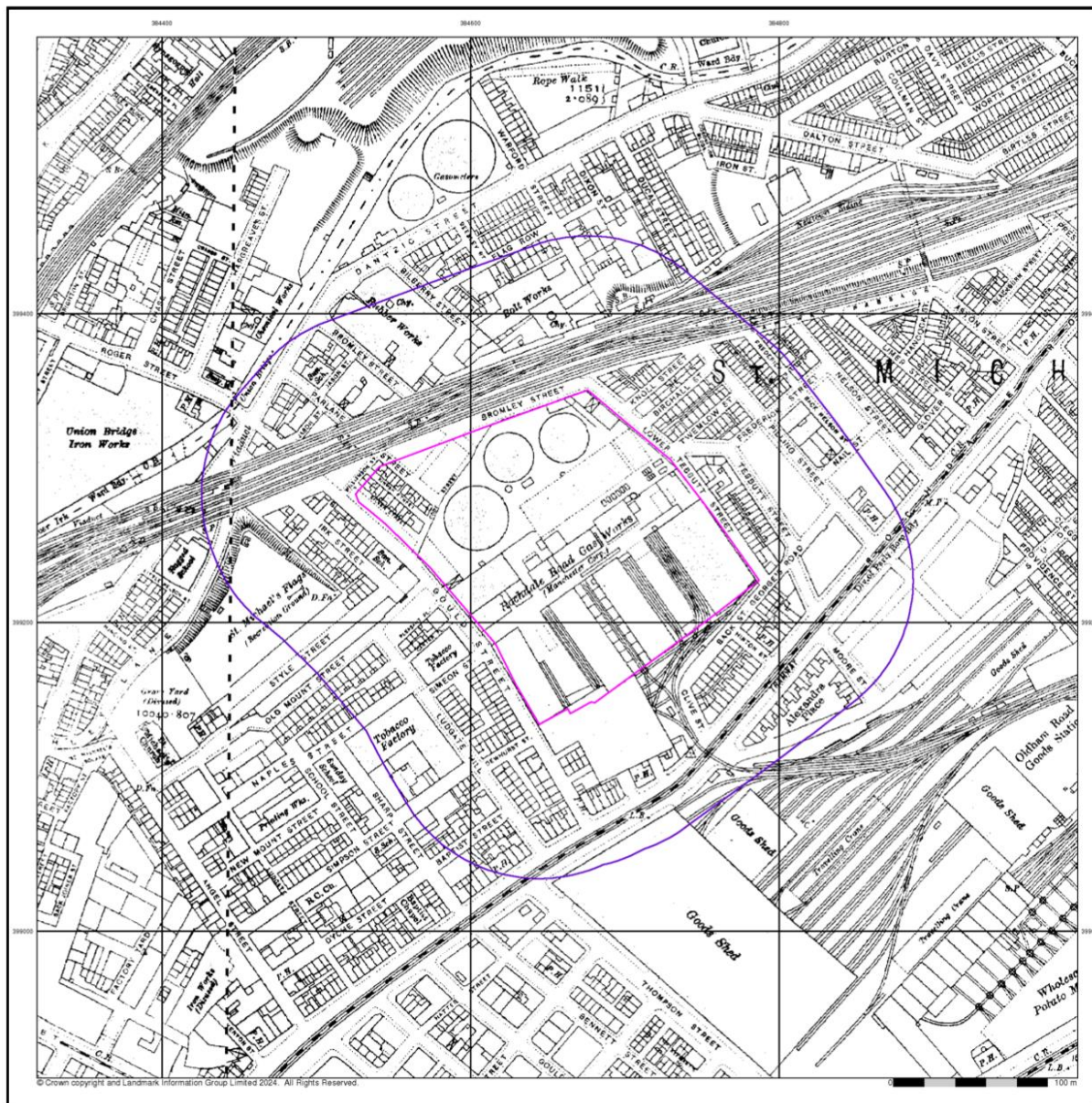




HISTORIC MAPS

Index of Historical Maps

Page No.	Date	Scale	Description/Remarks
B-2	1922 - 1933	1:2,500	The Site pre-WW2 lies within a well-established built-up area and is both residential and Industrial in nature. Within the Site boundary lies "Rochdale Road Gas Works" which includes three gas holders as well as four large sheds with rail lines used for loading/offloading. There are also several smaller ancillary buildings whose exact usage cannot be determined but can be assumed to form part of the infrastructure required for the Gas Holders.
B-3	1948 - 1949	1:1,250	For the most part the Site remains unchanged except for the southeast corner where one of the sheds has been removed and replaced with a conveyor.
B-4	1968 - 1990	1:1,250	There has been post war development that has taken place within the Site boundary. The three gas holders remain unchanged. However, the three sheds/conveyor and rail lines have been removed and replaced with one large building which occupies the entire southern half of the Site area.
B-5	1992	1:1,250	Further development has taken place within the Site boundary. The Site is now titled as a "depot". It appears that the entire Site has undergone change, this includes both the large building that occupied the Southern half of the Site and the removal of the three Gas Holders.
B-6	2024	1:10,000	Further changes have taken place within the Site boundary. All former buildings have been reduced to ground level. The Site at present is being utilised as an "off road" carpark.



EOD Contracts Ltd

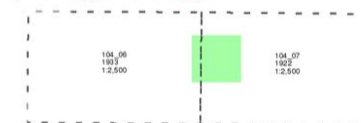
Lancashire And Furness

Published 1922 - 1933

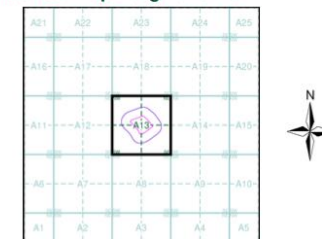
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 349249836 1 1
Customer Ref: 24210 Gould Street BROWNFIELD
National Grid Reference: 384660, 399250
Slice: A
Site Area (Ha): 3.05
Search Buffer (m): 100

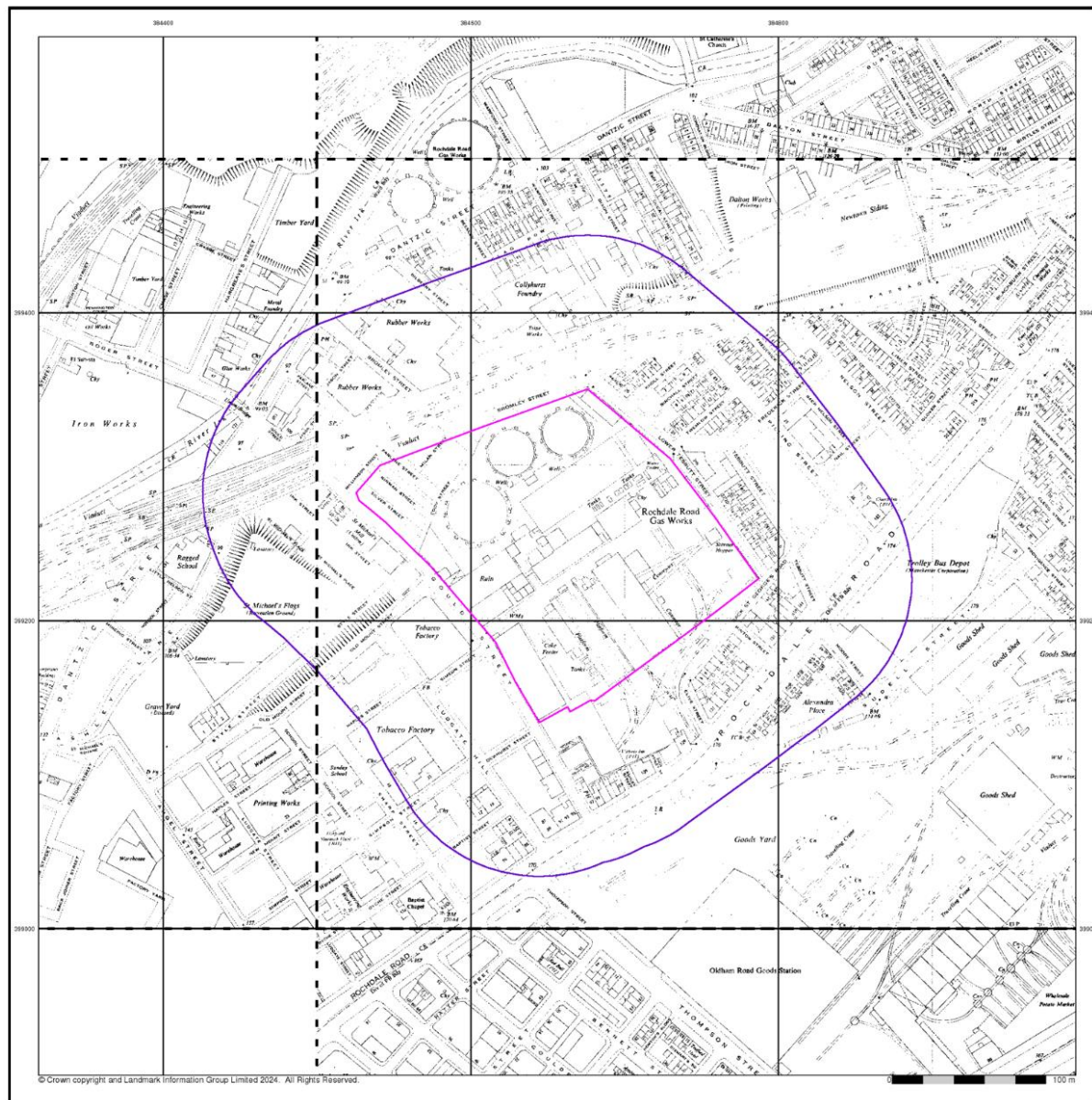
Site Details

Gould Street, Manchester, M4 4BH

Landmark
INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

A Landmark Information Group Service v50.0 06-Jun-2024 Page 4 of 19



EOD Contracts Ltd

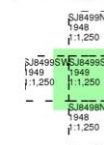
Ordnance Survey Plan

Published 1948 - 1949

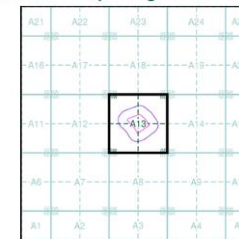
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 349249836_1_1
Customer Ref: 24210 Gould Street BROWNFIELD
National Grid Reference: 384660, 399250
Slice: A
Site Area (Ha): 3.05
Search Buffer (m): 100

Site Details

Gould Street, Manchester, M4 4BH



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envisiocheck.co.uk

A Landmark Information Group Service v50.0 06-Jun-2024 Page 5 of 19